SEVENTY-FOURTH YEAR

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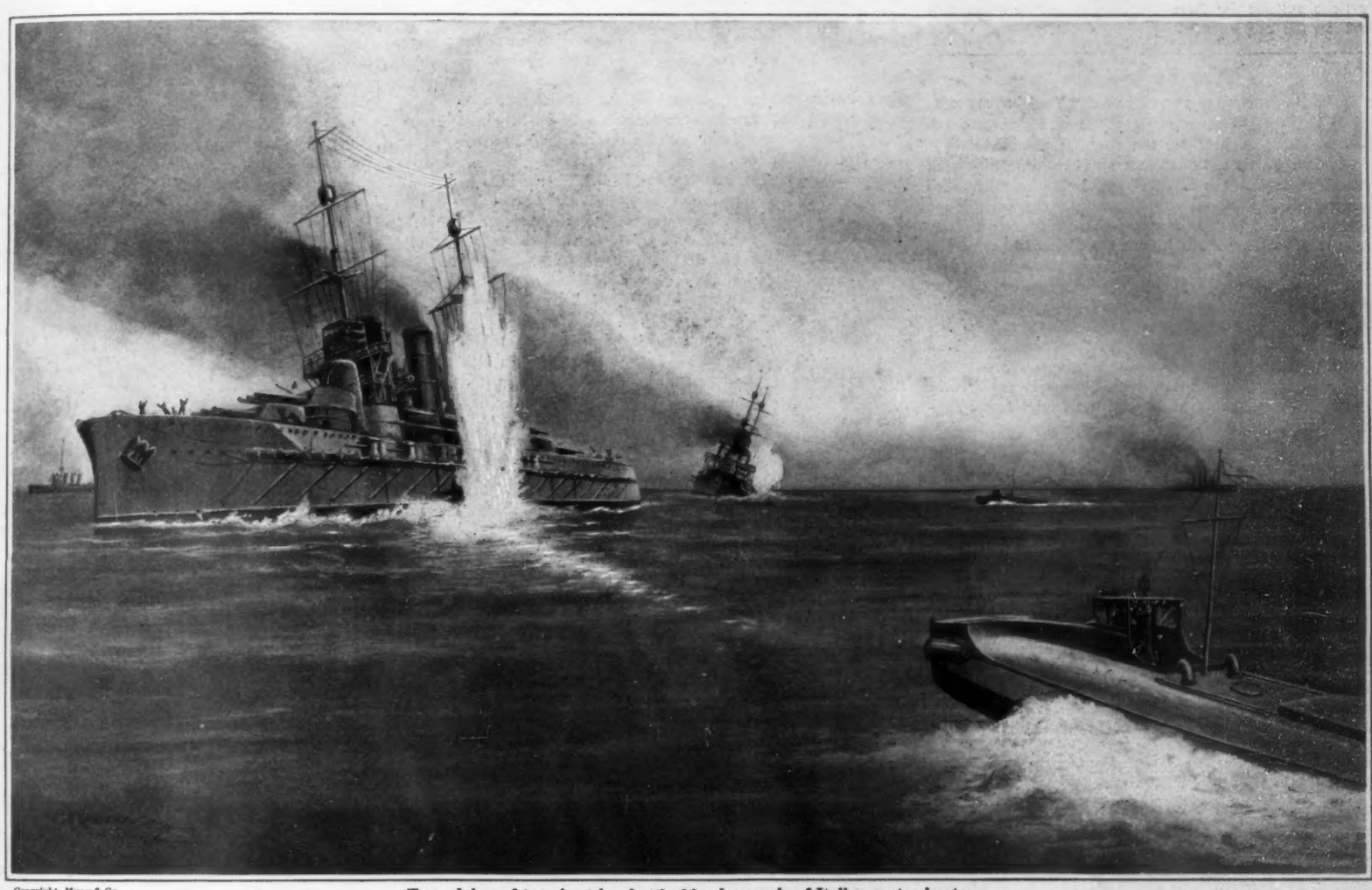


Torpedoing of two Austrian battleships by a pair of Italian motor boats

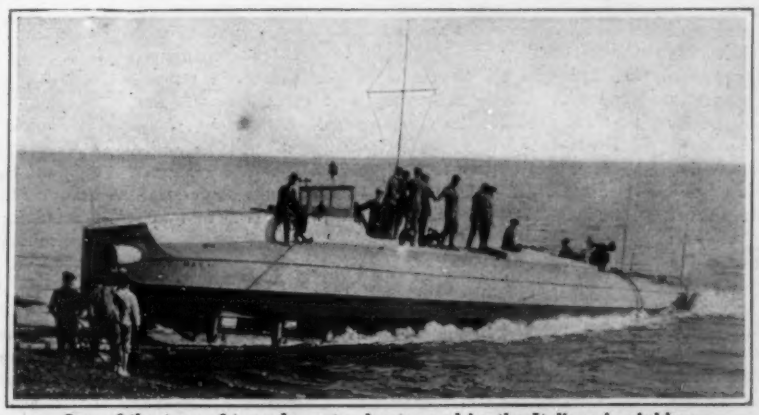
Motor Boats Sink Battleships

How Two Motor Boats Penetrated a Screen of Destroyers and Sank Austrian Dreadnoughts

THIS has been a war of surprises, and he would have been a bold prophet who ventured to assert that a pair of little motor boats would be able successfully to attack an enemy's dreadnoughts when they were fully screened by destroyers. But the thing has been done by the selfsame man who, in a daring night raid, broke through the harbor defenses of the enemy at Trieste and sank the coast-defense battleship "Wien."

Commander Luigi Rizzo was scouting along the Dalmatian coast, in company with another motor boat in charge of Commander Millazo, and in the dim light of approaching dawn he had just finished his patrol and turned for his base when he sighted, about ten miles away, a cloud of smoke. Turning he headed back at full speed to discover that two of the latest dreadnoughts of the Austrian navy, of the same class as the "Viribus Unitis," which was recently torpedoed in the Austrian harbor of Pola, were proceeding down the coast surrounded by a screen of 10 destroyers. There was only a very faint light, and the attack was favored also by the prevalence of a slight mist. Commander Rizzo selected the leading battleship and assigned the second battleship to the other boat.

The attacks seems to have been a complete surprise; for the little craft dashed in between the destroyers and Rizzo got off two torpedoes at a range of 250 yards—the first striking the mark between the two funnels and the second getting home just abaft the second funnel. He then ran for it, escaping between the second and third destroyers in the line. He was sighted by the fourth destroyer which gave chase and opened fire; but, according to his own cabled description, he was too close to be hit, the destroyer evidently being right on top of him. He then dropped a depth charge, such as is used against submarines, which exploded beneath the destroyer. To use his own words: "I saw her leap into the air, turn sharply and then stop, giving up the chase and permitting us to escape." Commander Millazo was also successful in penetrating the line, and torpedoed the second battleship. Rizzo states that the ship which he attacked immediately took a heavy list, and in view of the fact that there was no available harbor within three hours' run of the crippled vessels, it is probable that either one or both were sunk, or that they have been run aground and are lost to Austria for the period of the war.



One of the type of torpedo motor boats used by the Italians in sinking Austrian battleships

This brilliant action, with its portentous loss to the Austrian navy, is one of the most daring and dashing feats in the annals of naval warfare. Theoretically, the motor boats should have been quickly sunk by the guns of the destroyers and the broadsides of the Austrian battleships. That these little craft should have run through the screen, sunk the ships, and got away scot free, makes it certain that the Austrians were taken entirely by surprise; something which, under the circumstances, should never have happened. The blame, of course, rests upon the destroyer screen, which was there for the express purpose of detecting and preventing any such attack.

Not only is this magnificent success a tribute to the seamanship and military daring of the personnel of the Italian navy, but it is a tribute also to the initiative and skill of the Italian Construction Corps. These motor boats are two of a very numerous class, in which the Italians have combined the high speed and quick maneuvering ability of the motor boat with the destructive power of the torpedo. The type is already familiar to the readers of the SCIENTIFIC AMERICAN. They are even smaller than the motor boats which were built for the British government by the Submarine Boat Corporation. The notable feature in the design is that they carry a pair of torpedo tubes in the bow for the

(*Concluded on page 599*)

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The object of this journal is to record accurately and lucidly the latest scientific, mechanical and industrial news of the day. As a weekly journal, it is in a position to announce interesting developments before they are published elsewhere.

The Editor is glad to have submitted to him timely articles suitable for these columns, especially when such articles are accompanied by photographs.

Sunk But Not Lost

NO longer must we think of all ships that are sunk by U-boats as being permanently lost to the Allied cause; for the announcement has come from London that, since January 1915, 407 ships that had been sent to the bottom have been salvaged. This is certainly good news; and even more encouraging is the statement that 147 of these have been recovered by certain improved methods during the five months of the present year. It goes without saying that these ships must have been sent down in comparatively shallow waters adjoining the French and British coasts; for there is a limit to the depth at which diving operations can be carried on. Probably many of them were ships that had been torpedoed and subsequently beached. The water, however, is sufficiently shoal over large areas in the North Sea, the Channel, and the Irish Sea for successful salvage operations.

The mention of improved methods will suggest to many readers of the SCIENTIFIC AMERICAN the system of salvaging by the use of compressed air, which has been used so successfully by Engineer Wotherspoon on this side of the Atlantic. Several of the more successful cases of the raising of large ships have been described from time to time in these columns, and it is probable that the same system is being used extensively by our Allies.

Just how many of these salvaged ships have figured in the British lists of losses we do not know; but we do know that every torpedoed ship is reckoned as a dead loss in the German lists. The aggregate tonnage represented by 407 ships must be very large. If we assume that the average tonnage is 3,000, which is probably below the actual figure, the total tonnage of these ships would reach about a million and a quarter tons—an amount which will go far to offset the net total loss since the U-boat war commenced.

Keep "Good Will" Alive

IS Germany stealing our markets while we sleep? The question may seem absurd. With her industries paralyzed by war and cut off from the outside world by an impenetrable wall of steel, how could German products make any headway in foreign markets? The answer is to be found in two very significant paragraphs from German papers which were recently republished in *Printer's Ink*.

One of these, from the Berlin *Tageblatt* of April 26th, reads as follows: "If the despised Yankee nation think they are going to win the war and force Germans out of foreign markets there is nothing to indicate this sentiment in their local and foreign advertising. Many of their advertising agencies have closed their doors through lack of patronage. Their much-talked-of captains of industry have cancelled advertising contracts everywhere. Germany and German merchants have increased their advertising space in neutral markets and at home. It pays to advertise in war as well as in peace. The farseeing merchant never stops advertising."

The other item, from the Berlin *Lokal Anzeiger* of April 20th, reads: "Nothing is more acceptable to the German nation than to note the fact that the North Americans have abandoned advertising their goods in practically all of the foreign markets. In the Latin-American publications, the market which they have always tried hardest to acquire, there has been a heavy loss of advertising. A prominent Buenos Aires agency announces the fact that 83 per cent of their United States advertisers have cancelled their contracts. This is also true in the Orient, and a careful compilation of the decrease in advertising there shows a greater depreciation than in South and Central America. In the United States itself there is not a paper which has not suffered a loss in its advertising lines, and that despite the fact that the last year showed an increase in the millionaire class of 973 individuals. In other words, the war has terrorized the American nation, but not the Germans; for a perusal of our periodicals will show that manufacturers still advertise even if they have not the goods to deliver, but with the idea of keeping their names before the public."

Evidently despite the handicap of war German manufacturers are not only looking forward to the resumption of commercial activity when peace is declared, but are now actually engaged in building a foundation for future business.

Immediately after Europe was plunged into the great struggle the SCIENTIFIC AMERICAN instituted a campaign of Industrial Preparedness for Peace. Our country had just awakened to its dependence upon the Old World, and we realized that if ever we were to secure our industrial independence that was the time to do it. It was very evident that we must make plans to offset the competition that was sure to arise at the close of the war. Our industries were stimulated by large orders for war materials, and we realized that at the end of the war, there must be some outlet for our industrial activities which would only be secured by extending our markets to foreign fields. However, when we ourselves were involved in the war, and restrictions necessary from a military standpoint were placed upon our shipping facilities as well as upon manufactures in the arts of peace, industrial preparedness for peace began to wane. The Germans have been keen to notice this, and are gloating over the fact.

Germans are past masters in the art of advertising. Very skillfully have they played up dramatic and sensational exploits in their endeavor to impress their enemies, neutral countries, and their own wavering peoples with the invincibility of their arms. But of much more serious importance is the advertising they have done to keep alive the reputation of German commerce.

Apparently many of our own merchants have overlooked the real significance of publicity. A man who does not give the matter serious attention is liable to think of advertising only as a means of selling goods. He does not realize that his advertisement is not merely purchasing a customer, but is also purchasing an intangible something which goes by the name of "good will." Advertisements build him a reputation, and the only way to keep this reputation alive is to persist in advertising, even when there is no immediate market for his products. Good will is like a tender plant that must be watered and cared for even when it is not flowering; and unless we are careful, the good will that our merchants have established is liable to die during the long drought of the present war. If neglected too long it may never flourish again. This is just as true of domestic trade as of commerce in foreign lands.

Our late entry into the war has been of great advantage to us; it has enabled us to profit by the mistakes of our allies. When England first engaged in the conflict, industrial conditions were badly upset and manufacturers at once curtailed their advertising. It was soon found that this would lead to disastrous results; that the reputations which had been established by houses of long standing were being forgotten and might be replaced by new concerns at the end of the war. The British manufacturer now realizes that he must preserve his good will even though he has nothing to sell. A most notable example of this is to be found in the automobile industries, which have been practically brought to a standstill by restrictions in the use of gasoline and also by the absorption of the industrial plants in the manufacture of materials for war purposes. Nevertheless one has merely to glance at the British automobile journals to understand what importance British manufacturers place upon the preservation of good will during the war. Scores of manufacturers of motor cars and accessories who have nothing to sell are advertising their goods, and booking orders to be filled after the war. This is true also of other industries. Some concerns even employ traveling salesmen with the object of keeping in touch with their customers. These salesmen are men who are past the military age or are no longer fit for military service; and it is their duty to call upon the regular customers of the concern and explain to retailers the difficulties which have made it impossible for the manufacturers to supply them with the goods they need. In this way the salesmen keep in touch with the old customers and preserve the firm's good will. Incidentally they do a great deal of quiet, personal work for the Government.

Up-to-date American manufacturers will be quick to appreciate this broadminded policy. The German in his boasting has let fall a valuable suggestion. Thanks. The "despised Yankee" is not slow to take a hint.

Shipbuilding in the United States

THE enlisting of the great abilities of Charles M. Schwab in the work of defeating the U-boat by building a vast fleet of merchantships, has unquestionably given great impetus and inspiration to the work of the Emergency Fleet Corporation. Speaking at the commencement exercises of the University of Notre Dame, Chairman Hurley of the Shipping Board did not put the case too strongly when he said: "Inspired by the enthusiasm and energy of the greatest organizer America has produced—Charles M. Schwab—whose unmatched abilities and splendid services the Government recently commandeered, and Mr. Charles Piez, Vice-President, who has spent six months developing an organization, our shipyards are getting their gait and setting a pace that would have seemed incredible in those very recent times when steamships required all the way from six months to two years to build."

The facts regarding the shipbuilding situation as given by Mr. Hurley are decidedly encouraging. On the 1st of June of this year we had increased the American-built tonnage to over 3,500,000 deadweight tons of shipping; and in the last ten months the Shipping Board has added approximately one million tons of new construction to American shipping. We have also added 730,176 tons of German and Austrian vessels; we have requisitioned 526,532 tons of Dutch shipping; and we have chartered from neutral countries an aggregate dead weight tonnage of 953,661 tons. Adding to this the tonnage of vessels which it has been necessary to leave in the coastwise and Great Lakes trade, we arrive at a total of more than 1,400 ships of 7,000,000 deadweight tons now under the control of the United States Shipping Board. That is to say, from all sources we have added to the American flag since we entered the war against Germany, 4,500,000 tons of shipping.

In the month of May alone our yards turned out a total of 260,000 tons, which brought the total for the first five months of 1918 up to 805,000 deadweight tons. Comparing this result with our shipbuilding effort in 1915 and 1916, we find that we delivered in five months of this year 336,900 tons of shipping more than we did in those two years. We presume that Mr. Hurley speaks with careful consideration of our future building capacity when he states that our tonnage output before the close of this year will be half a million tons each month.

The shipbuilding program, we are told, calls for the building of 1,856 passenger, cargo, refrigerator ships, and tankers, ranging from 5,000 to 12,000 tons each, with an aggregate deadweight tonnage of 13,000,000. Also, to expedite loading and unloading at terminal ports, and the transfer of freight to and from ships and docks, the Shipping Board is contracting for 200 wooden barges, 50 concrete barges, 100 concrete oil-carrying barges, and 150 steel, wood and concrete tugs of 1,000 horse-power, all of which combined will have an aggregate deadweight tonnage of 850,000. Furthermore, the Board have commandeered 245 vessels, averaging 7,000 tons each, with a total deadweight tonnage of 1,715,000. So that, altogether, in carrying out the present program, and exclusive of the tugs and barges above mentioned, which, as we have seen, represent 800,000 tons, the Shipping Board is building and will put on the seas 2,101 vessels with an aggregate deadweight tonnage of 14,715,000.

We cannot build up our merchant marine so quickly and on so vast a scale without having to go deeply into the national treasury. As a matter of fact, the program for 1918, 1919 and 1920, will call for the expenditure of five billion dollars, and for this sum we shall secure a new merchant fleet aggregating twenty-five million tons of shipping. "But," says Chairman Hurley, "the expenditure of this enormous sum will give to the American people the greatest merchant fleet ever assembled in the history of the world—a fleet which I predict will serve all humanity loyally and unselfishly upon the same principles of liberty and justice which brought about the establishment of this free republic."

As to the total output for the present year, Mr. Ferguson of the Newport News Shipbuilding Yard and Mr. Powell of the Bethlehem Steel Shipbuilding Company, have predicted that we cannot turn out more than three million tons in 1918; but Mr. Schwab, judging from the present conditions, believes that this will be exceeded. During the year 1919, the average tonnage of steel, wood and concrete ships continuously building on each shipbuilding way should be about 6,000 tons; and if the 751 ways of the Emergency Fleet Corporation are continuously in use, and each can average an output of three ships per year, the Shipping Board should turn out in one year 13,518,000 tons.

Standard Scale for the Sugar Industries

AS stated in the annual report of the Bureau of Standards, the existence and use of more than twenty different Baumé scales have caused much confusion and misunderstanding in the industries, especially in sugar manufacturing, where the various scales are used indiscriminately in determining the density and percentage of sugar in solutions. At the request of the Association of Official Agricultural Chemists, the Bureau of Standards has constructed a new Baumé scale, together with tables for its use giving equivalents in per cent sugar and specific gravity. The new scale is to be used at 20 degrees C., the standard temperature in sugar analysis. It is based on the specific gravity values of F. Plato, which are considered the most trustworthy available.

Aeronautical

"Keep Off" Signs of Switzerland.—Following upon the last violation of Swiss neutrality by the bombing of Porrentruy by unknown aviators, the Swiss government has proposed to the belligerents that the Swiss frontier be marked at night by elevated colored lights. France and Germany, it is reported, have already given favorable replies.

The Turkish Airman: A Gentleman.—During the funeral of General Sir Stanley Maude, a Turkish airman flew over the cortege and dropped a wreath 500 yards in front of the column. The machine then dipped twice, about-turned, and flew back to its quarters. Whilst it was flying over the city, and before its mission could be divined, the machine was subjected to anti-aircraft fire, but fortunately it evaded the shells.

Increasing Effectiveness of Anti-Aircraft Artillery.—Aerial progress has not been confined to the air, for anti-aircraft artillery, if it can be considered as part of aerial activity, has advanced by leaps and bounds of late. At present it is a common occurrence to hear that an enemy machine has been brought down by anti-aircraft fire. Typical of this advance is the case of the 10th Section of French anti-aircraft artillery of the mobile type, which, during the period from September, 1915, to December, 1917, alone brought down 13 German airplanes. During the period from February 11th to 20th, last, the anti-aircraft artillery of the French army brought down four machines. In each case the number is based on official recognition, which means that the destruction of each enemy machine was established beyond doubt.

Airplane Postal Service to Corsica.—According to the Paris daily press, an aerial postal service will soon be organized between Nice and Corsica, and it will be carried out by the use of hydro-airplanes. The landing place in Corsica has not as yet been fixed, but it is likely that Ajaccio will be chosen for the purpose, it being the terminal of the railroad line, and besides it affords a very good landing place for hydro-airplanes. The distance to be covered in a straight line is about 150 miles. A great advantage will be secured by the present service, for it will allow of carrying all the ordinary letters, while the packages classed as mail matter will be transported by boat as usual. A postal hydro-airplane of improved type will carry upwards of 450 pounds of mail on each trip. Letters will arrive in Corsica in much less time than before, for the trip can be made in a few hours.

American Battleplanes are now beginning to make their appearance on the Western front, and while no details are available at the present moment regarding the types in use, it is of interest to note the changes undergone by well-known types of domestic machines. Certain of our machines have taken on characteristics of German battleplanes, such as the tapered front, propeller pot, and fish-like fuselage, while others have taken on the characteristics of the French Spad and the British Sopwith fighter. The American machines in several instances are enclosing the V-shaped engines, leaving only the exhaust pipes showing, and these are grouped into one pipe on either side, which leads back and ends in a perforated taper. One well-known type of American airplane has been so materially changed of late that it is at first confounded with the French Spad: the engine is entirely enclosed; the wing arrangement is similar to the Spad; and the strut arrangement is identical to the French machine.

How Airmen Hampered the German Drive.—German prisoners are again complaining bitterly, according to the *Morning Post*, that since the present offensive began, their own airmen have given them insufficient protection from the bombing activities of the British flying officers. One referred especially to the British bombing of German troops and billets in the Bapaume area, where apparently great execution was done. This prisoner assumed—not unnaturally perhaps—that the British work in the other areas outside his personal experience had been equally deadly for his compatriots. A German officer prisoner belonging to a famous regiment stated that a few days before he was taken, a British airman dropped a bomb on an ammunition train in Weincourt station, and that the whole train exploded. It had been carrying a large number of shell for the 36 cm. Austrian guns. As a result the guns in question were able to play but a small part in the bombardment leading up to the German attack of April 24th, for lack of ammunition. Another prisoner enlarged at length upon the remarkable number of casualties caused by British bombing airmen in the Bapaume area at the end of March and during the first half of April. This prisoner said he had seen great masses of wrecked German transport and very many dead horses killed by the British bombs. The number of killed and wounded among the troops was also very large indeed. One German aerodrome, which he named, had to be moved back 17 miles in order to protect it from the British bombs. This was not regarded as very helpful to the German infantry.

Science

New Mercury Vapor Pump.—The U. S. Bureau of Standards has developed an improved mercury vapor air-pump, so simple in construction that it can be built by a reasonably skilled glass-blower, which readily evacuates to pressures much lower than 0.0001 millimeter. It works by two stages in connected units, each operated by mercury vapor from a single boiler, a single gas-burner being used to evaporate the mercury.

A Salinity Recorder.—An apparatus has recently been announced that will give a continuous record of sea-water salinity by the measurement of its electrical conductivity. A pair of electrolytic cells has been designed which, when used with a suitable alternating-current galvanometer, will give satisfactory operation in connection with a recorder. The temperature compensation is obtained by placing both cells, which are in the two arms of a Wheatstone bridge, in a uniform temperature bath.

Calcium Chloride for Hardening Concrete.—According to a statement from the Bureau of Standards, calcium chloride has been found to be an effective accelerator in the hardening of concrete. Tests indicate that the addition of a small amount of this substance with some cements in 1:2:4 concrete resulted in a strength increase of about 100 per cent in 24 and 48 hours. Further tests show that concrete gaged with a six per cent solution of calcium chloride increases in strength from 60 to 110 per cent in two and three days, and tests up to six months do not indicate any detrimental effect from the addition of the calcium chloride.

River Ice of Last Winter.—The severe winter of 1917-18 produced unusually heavy ice in the northern rivers of the United States. The most remarkable ice gorge was that formed in the Ohio River above Sugar Creek, between Cincinnati and Louisville, marked by great hills of ice, some more than thirty feet high, and pushing far up the valleys and ravines and over the lower banks. By February 31 the water was 25 feet higher above the gorge than below it. This gorge held firm for 58 days and broke on February 12th, but fortunately the water had then formed a channel underneath so that the river above was at a comparatively low stage. Along the Ohio River alone the loss due to the breaking up and passing out of the ice, including that caused by suspension of business, was estimated at $3,212,205. A full illustrated report on the ice conditions in the various rivers of the country last winter is published by the Weather Bureau in the *Monthly Weather Review* for February.

The "Bar" as a Unit of Pressure.—In meteorological circles extensive use is now made, especially in upper-air observations, of a unit of pressure called the "bar," and defined as equivalent to one megadyne (1,000,000 dynes) per square centimeter. This unit was officially approved at international meteorological meetings just before the war, and is now used on the British and French weather maps; *i. e.*, the isobaric lines are labeled in millibars (thousandths of a "bar"). Unfortunately the similar names "barad" and "barye" were adopted, respectively, by committees of the British Association and the International Physics Congress (the first in 1888 and the second in 1900) for a pressure unit of one dyne per square centimeter (one-millionth of the meteorological "bar"). To make matters worse, some writers have used the term "bar" as a synonym of "barad" and "barye," so that two distinct "bars" are now found in standard literature; the "millibar" of the meteorologist being equivalent to the "kilobar" of physicists and chemists, though the latter terminology has actually been very little used. This diversity of usage recalls the case of the several kinds of "calorie." The matter will have to be dealt with eventually by some authoritative international scientific organization.

Studies on Malaria Mosquitoes have been conducted for some time by the U. S. Bureau of Entomology in the delta region of the lower Mississippi Valley. The agricultural importance of the disease in that region is illustrated by the fact that on a typical plantation cultivating 1,800 acres of land the loss from malaria in one season amounted to $2,200 through loss of time and to $4,300 through inefficiency due to the infection. Of the four species of *Anopheles* occurring in that part of the south it is found that *A. quadrimaculatus* is the one principally concerned in the transmission of malaria. In New Orleans the Bureau has reared large series of specimens for experiments to test the resistance of the malaria parasites to low temperatures while in the body of the mosquito. These tests show that the tertian parasite is able to survive a temperature of 31 degrees Fahr. for a period of four days. More detailed investigations are in progress to determine the possibility of the malaria parasites surviving the winter in the body of the mosquito host. A long series of dissections of adult *Anopheles* collected during the winter about habitations gave no evidence of infection. This result is in accordance with the conclusions of other investigators that man rather than the mosquito is the winter carrier of the malaria germ.

Automobile

Ancient and Modern Roads.—Modern road engineers seem to have great difficulty in determining how a really good and substantial road should be built. This is hard for the layman to understand, when we consider the roads built by the Romans a thousand years ago, which, except for neglect of the surface, are still giving good service. Then there are the notable roads of the Continent, that have survived hundreds of years traffic. It would seem that a study of such roads would furnish much needed information; but possibly the trouble lies in a futile attempt to get something for nothing, by spreading the cost of one mile of good road over 10 miles of makeshift.

The Glassless Lens.—A new device has appeared for keeping the light projected from the headlight within legal limits. It is described as an all-metal, cellular attachment that is put in the upper half of the headlamp, behind the regular glass door. It contains more than nine thousand small metal reflectors, constituting approximately nine square feet of highly polished reflecting surface. The object of the "glassless lens" is to deflect those rays which normally rise above the 42-inch level and cause glare, and to project them instead upon the roadway where they are wanted. The principle of construction is said to cause the device to transmit 93 per cent of the lamp's candle-power.

Windmill Drive for the Electric Car.—Mr. A. I. Root, the bee man of Medina, Ohio, whose hobbies include an electric automobile which gets its current from a windmill, reports that he is making much progress in this matter. He has been able to charge his batteries to a point where his car ran 62 miles without recharging. He confesses, however, that this is the exception; ordinary winds will not charge to the full capacity of the batteries. Mr. Root is not sure that his initial and operating costs are yet such as to put the thing on a commercial basis, but is confident that windmill drive for the automobile will be a feature of the rural life of the future, and that it will have a development quite parallel to that of electricity canned from water power.

Natural Gas for Fuel.—Having conditions in England in mind, and the possibility that the use of gasoline may be limited in this country, the suggestion is being made that our great stores of natural gas may be used as a substitute for liquid fuels. The stumbling block, however, is to find a means for carrying enough gas to make it worth while to use it. Compressed gas sounds well, but the proposers of this plan apparently lose sight of the fact that cylinders for containing compressed gas are heavy, and at best very bulky, so that it is difficult to find room on the ordinary vehicle to carry a supply for more than five miles. The problem of carrying a practical amount of gas fuel has not yet been satisfactorily solved in England, and the indications are that we should turn our attention to liquid fuels other than gasoline, or petroleum products.

Road Construction.—In considering motor transportation it would be well to distinctly recognize the fact that a very large proportion of our so-called good roads were never designed for any such use, and that in their construction frequently most superficial methods were followed. In many cases road building consisted only in grading and leveling existing roads, laying down a few inches of small, broken stone and spreading over this a layer of gravel, the whole being compacted by rollers and sprinkled with an oil, tar or asphalt binder. This construction serves fairly well for light pleasure traffic in the touring season, but is entirely unequal to, and unsuited for heavy loads, especially in bad weather; and the haphazard methods of maintaining our roads favors the processes of destruction. As a matter of fact most of our "good roads" will have to be entirely rebuilt in the near future, as a result of short sighted economy, and a desire to spread the available funds over as many miles as possible.

Instruction Books.—Many elaborate instruction books have been issued by different manufacturers, which are supposed to tell the owner-driver in detail how to operate and care for his car, and while excellent for the man of some experience many of them do not prove satisfactory to the novice. For example, we frequently find a careful description of the mechanical details of a lever, and instructions how to use it, but not a word is said as to what this lever does, and why. Without this essential information the novice cannot operate his car intelligently. An actual case of this kind is the instruction to "pull the priming wire and then crank the engine." A fairly experienced driver was observed following these instructions carefully, but as he had forgotten to close the ignition switch, and pulled the wire faithfully every time he turned the crank, he soon had the carbureter so thoroughly flooded that the engine would not start when the switch was closed. The men who prepare these instruction books are not incompetent, but they know too much, and are apt to omit trifling, but essential details. It requires a special faculty, or special experience to be a good instructor.

In Unknown Soapdom

Some of the World's Little Known and Featureful Soaps and Soap Substitutes

By L. Lodian

THE soaps of the Holy Land and of the Hellenes have not changed since the days of the apostles or of Alexander the Macedonian. They preserve the same simple shapes and forms, and are innocent of any other than the plain olive oil. The ever fresh fragrance, however, is nature's own peculiarly refreshing perfume. Note the Arab soapmaker's molded trademark and name on his goods, in the beautiful Arabic characters—of all eastern scripts the most charming to the eye. The device indicates that they were made at Terepoli, not far from Jerusalem.

The Hellenic soaps have the Greek characters. These Levantine soaps are the prototypes of those in use today all over the world. There is little originality or variation in soapdom; the items which really deserve a place in the camera's eye can almost be counted on the fingers of one hand, in spite of some 30,000 known brands for the entire globe. The most of the few really featureful soaps are illustrated in the present article—and they are all from the old world. About the only out-of-the-ordinary variation produced in the western hemisphere has been an eight-sided cake—and that seems hardly worth illustrating.

It should be noted that floating soaps are not an American or a European invention. The Levant has had them since the remote past, buoyancy being secured by incorporating air in the mobile hot mass just before cooling and molding. Many types of floating soaps are now available: floating glycerine, tar, salt-water, shaving, castile, bar, ball-form, even down to a floating soap for doggie, and the common resin soap of the washboard.

One of the illustrations is of a small batch of harem soaps, imported from Stamboul. They are always ornamental, of mild cedar-like fragrance, and made in small shapes to fit conveniently the hands of their users. There are a score of other forms of these seraglio soaps—stars, crescents, floral stamp-outs, twists, ovals, Arabic inscriptions, mottoes for the faithful, educational series, etc. All are pure olive oil soaps. The soap of the zenanas of Hindustan—in Levantine and the far eastern countries, whatever is used in the quarters of the fair is the criterion for excellence, ranking with the boudoirs and salons of Paris—is slightly larger, unperfumed, made from copra-oil stock, quite plain, and shaped uniformly in a hemisphere. The chief characteristic is the dazzling snowy whiteness, such as only the use of an oriental copra-oil can give to a soap.

Soap-paper, or paper soap, first materialized on the continent of Europe, about half a century ago. Although in limited use in the United States for the past score years or so, it has never here acquired the vogue of the now well-known paste, powder and liquid soaps, the chip and flake soaps, *et al*. It is obtainable in roll and in sheet form, the latter either loose leaves or wire-stitched. One trifling piece about the size of a cigarette paper is sufficient for washing hands and face; it lathers quickly in cold or warm water, and the tissue paper base promptly fades into an insignificant pellet or wad smaller than a match head.

Soap-making and candle-making are twin industries in Europe; the book literature of the two, even, is usually in the same volume. In America the same condition prevails, though to a less extent because of the smaller consumption of candles here. Paris produces the most expensive toilet soaps of the globe, soaps that retail right here in New York at two to four dollars for a small cake about half the ordinary bathroom size. From French soap factories come also the hollow or tubular or perforated candles illustrated. There they have been made for the past three-quarters of a century. The object of the holes is to prevent guttering or dripping of the grease on one's sleeve or coat or dress, as when carrying a lighted candle up stairs. Instead of running down the outside of the candle, where it would be wasted, the grease finds an overflow outlet down one or another of the holes—but for a few centimeters only, as it hardens almost at once. Then as the candle burns down to it, this drip in turn supports the combustion, until the whole candle has been consumed with a maximum economy. The air supply being abundant the light is good, and the candles of long burning capacity; one of the "sixes" (six to a pound) is good for seven or eight hours of continuous use.

The economy perforated candles made by the large French soap works

These hollow *bougies* have been imported into America, where they have had a restricted sale for the last 50 years; but the Hun scourge in Europe has contributed to curtail the output, so no more come here. Such candles might be made by our own soap- and candle-makers, as there are no patent rights involved. The same cause has also cut off the export of the two-and three-wick candles, double and treble lights carried on a single base, thus requiring but one candlestick.

The many soap-substitutes of the world have been repeatedly covered in magazine articles and encyclopedias; and almost any good sized dictionary will be found to contain a fairly complete listing of them under the caption of soap. There are soap-barks, soap-roots, soap-berries, soap-nuts, etc. They contain, for the most part, saponin, and will lather in water; so they are used to some extent by the dyers and cleaners of fabrics where the ordinary grease soaps are inconvenient, or might injure the fabric. Readers of the SCIENTIFIC AMERICAN are especially familiar with *Sapindus muskorossi* grown in former years in Florida and now in California by the enthusiastic Mr. Moulie, and with which one can wash one's hands in the raw, without any special preparation. This soap-nut is indeed quite an all around utility, since in addition to the soapy principal of the outer husk it is a first class foodstuff and yields a valuable oil.

These soap substitutes are often largely used by the natives of the regions where they grow, for their every-day washing, in lieu of the city fat-soaps; but they are seldom found in the retail trade of the towns in competition with ordinary washing soaps. They lack the compactness of the latter; they are usually somewhat messy, littering up the place where they are employed. Moreover the bases of supply are usually too scattered and remote, even from the nearest big cities, and a continuous, steady supply would be a problem. The one exception, which is always available, is the compressed rice-bran disk of the Mongols and Manchus. These disks are readily obtainable among oriental importers and retailers. Moreover, the cereal brans of American origin are available almost everywhere, in town or country; and our folks should know more about bran as a substitute for soap.

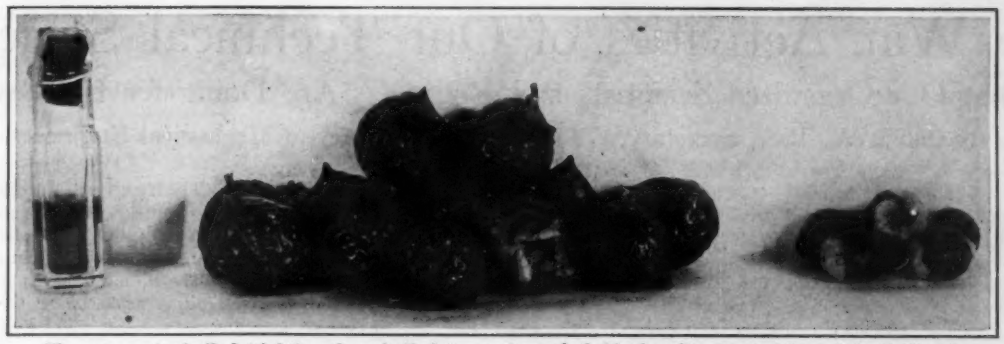
Compressed rice-bran soap from China

The Asiatic republic has few soaps as we know them. The refuse rice-bran in disks about six inches in diameter and something like a quarter of an inch thick, has been their chief ablutionary detergent since remote ages past. A small handful of bran is placed in a cotton sack, washed in warm water, then passed over the skin as a sponge might be.

Among soap anomalies may be mentioned human-fat toilet soap, known over continental Europe the past century or more, and indicated by some medicos as a superior emollient. In the leading soap-

Left, French soap papers, Italian shaving stick, and Arabic soap cake; right, ornamental harem soaps from Stamboul

technologies this unique, if bizarre, product is invariably formulated, as instance the following from Dussauce, Fabrication du Savon, page 701: "*Savon de gras humain* (soap from human fat); human fat gives a hard soap, which dries quickly, and becomes yellow." This sounds callous, but the art of soap-making is not particularly noted for fine sentiment. The fat-stock was obtained from cadavers of hospital and morgue derelicts, and tried out like any other fat. Candles for special purposes have also been made from human fat. Then there is equally callous mention of horse-fat soap, dog-fat soap, kangaroo-fat soap, monkey-fat soap, sewage-fat soap reclaimed from suggestive but unmentioned sources. All fats pay tribute to the soap-maker's kettle and some kettle it is; divers of them are the height of a five-story house.



The soap nut, shelled (right) and unshelled (center); and (left) the oil extracted from it in California

The clay-ball soaps of the Malabar coast and Singapore region, which the visitor can purchase in the native bazars, owe their detergent property to the silica content of the clay. They are dirty brown in appearance, heavy, and unsatisfactory to use, yet "good enough for the natives." China clay or kaolin is another passable detergent from the earth, this time white in color.

During the past couple of years the soap-makers have seen the prices of their raw fats skyrocket to such a height that they listen eagerly to any suggestion of new sources of supply of oil fats which might cheapen their manufacturing costs. One possibility exists in the coquito of South America, now wasted. The word signifies "little cocoanut"; the nut to which it is applied has an oil content of 50 per cent. At full maturity it is about the size of a plump olive. Like the regular cocoanut of commerce, it has the three eyes, only one of which can be perforated; and in odor and flavor it is identical with its bigger brother. The kernels are hollow, holding half a thimbleful of milk. This is the same palm that, in its sap, yields the only palm sugar produced in the western world.

Making a Scale for Egg Testing

PROBABLY most poultry keepers are familiar with the way of telling the age of an egg by specific gravity. For those who are not acquainted with the plan the method may be briefly described. A solution of salt and water is prepared, one part of the former to two parts of the latter being allowed. It is preferable to employ rain or distilled water. The eggs when placed in this salt mixture behave according to their age and, in this way, it is possible to tell how old they are with great accuracy.

An egg up to 36 hours old will sink to the bottom of the vessel and lie in horizontal fashion. When between two and three days old the egg floats horizontally just below the surface of the solution. There is a slight tendency on the part of the thicker end to rise upwards. When from four to five days old this tendency becomes more pronounced; the long axis of the egg (an imaginary line drawn through the center lengthwise) stands at an angle of 20 degrees from the perpendicular. The angle increases daily until at the end of the eighth day, it is 45 degrees; on the fourteenth day it is 60 degrees, on the twenty-first day 75 degrees, while at the end of a month the egg will be upright in the solution; the smaller end downwards.

The changes in the manner of floating are due to the following fact. In the thicker end of the egg there is an air space. As the days go by this space tends to become larger owing to the evaporation of moisture through the pores of the shell. This loss of moisture naturally means that there is more air in the egg, and its manner of floating thus varies from day to day.

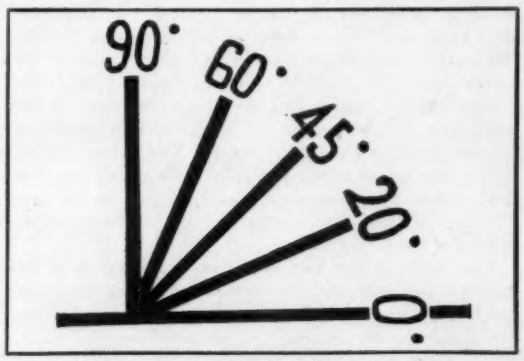
To find out the exact angle at which an egg is floating at any time is a simple matter if a diagram is prepared on the lines shown in the illustration. It will be seen that a scale of degrees has been drawn out on a card. The perpendicular line represents 90 degrees and, from this downwards, the different angles are shown to the horizontal 0 degree. The diagram should be boldly drawn so that in all ways it is very plain. The salt solution is put into a glass jar and the egg to be tested is then placed in the mixture. The card is held on the outside of the jar and the egg worked up to that side. It will then be possible to see at a glance the angle at which the egg is floating and, in this way, discover its age. Nowadays the consumer of eggs needs some way of checking up his dealer; and he could hardly ask a scheme which would be at once as accurate and as easily applied as this one.

Concrete Ship "Faith"

THE American concrete steamship "Faith" the first large ocean-going vessel of concrete in the history of the world to make a successful voyage with cargo, completed her maiden and trial trip on June 2d by tying up to the dock at the Canadian port of Vancouver. The "Faith," loaded with a rough cargo of salt and ore, left San Francisco on May 22d, touching at Tacoma and Seattle to unload. Never did a ship receive stiffer tryout. Her cargo was a hard one, and coming up the coast she ran into a stiff gale, heavy head seas and wind averaging 65 miles an hour. Yet she rode this out splendidly.

Baby cocoanuts, now wasted, a possible source of soap

The "Faith" is 5,000 tons deadweight capacity, 336 feet long with 44.5 foot beam. She proved easy on fuel, averaging 10 knots at 79 revolutions on 120 barrels of fuel oil per 24 hours. The vessel, on arrival, had not taken on a drop of water since May 14th, and the fuel oil in her deep tanks had shown no stain through the tank wells, although fuel oil will in time come through wood or almost any joint of man's making. One notable discovery was that the 1,600-horse-power engines caused no vibrations to the hull. They are built on solid cement foundations, and ran like turbines during the whole trip. The "Faith" carries electrical steering apparatus, and according to her captain is the best steering vessel for her size, he has ever been on. As a result of the trial trip it was found that only the most minor of changes are necessary. A few sections of pipe in the engine room which were not sufficiently stayed will be rebraced. It was also found that her superstructure should be more securely bolted to the deck. To avoid the deck houses being carried away she was hove to for a while in the big storm she encountered.



A home-made protractor for testing the freshness of eggs

The "Faith" is a little rough, having been got up hurriedly for her trial trip. She has the bluff bow similar to the old square-ended, straight-lined tramp, but the superintendent of her construction stated that in later boats of the same type to be built by his firm the lines would likely be finer. Plates of steel around the vessel's forward hawse-hole to protect the concrete from the anchor flukes, and a strip down the prow, are the only material other than concrete showing on the vessel's side. She still shows the marks of the board molds. The deck is planked above the concrete and part of the superstructure is of wood, but the main body of the vessel is concrete. Between 550 and 560 tons of steel rods were used in her and she is strongly reinforced with steel angles at points where the strain is greatest.

The voyage has been watched with anxiety and hope by men high in shipping circles of the Allies, for with the success of concrete ships proved, the way lay open to solving the ship shortage problem, as concrete ships can be built much more quickly and easily than either those of wood or steel. According to her constructors about forty per cent of the amount of steel used in ordinary steel vessels goes into concrete ones, but this amount they hope to cut down. The steel, however, is rod steel and so makes no demand on the plate-rolling mills. Three Government engineers accompanied the vessel to Vancouver from San Francisco with measuring instruments for stress and vibration, and immediately upon their arrival left for Washington to make report.

That the trip was in every way satisfactory is evident by the fact that following the "Faith's" docking, the president of the building company announced that eight more ships would be begun at the company's yards in Redwood City. The new concrete vessels are to be 50 per cent larger, or an average of 7,500 tons deadweight capacity. The success of the "Faith," apart from the importance it may have toward determining a solution to the ship shortage problem, is a triumph for American shipping, for the United States is the first nation in the history of the world to launch a large concrete freighter which proved satisfactory on long ocean voyage loaded with cargo.

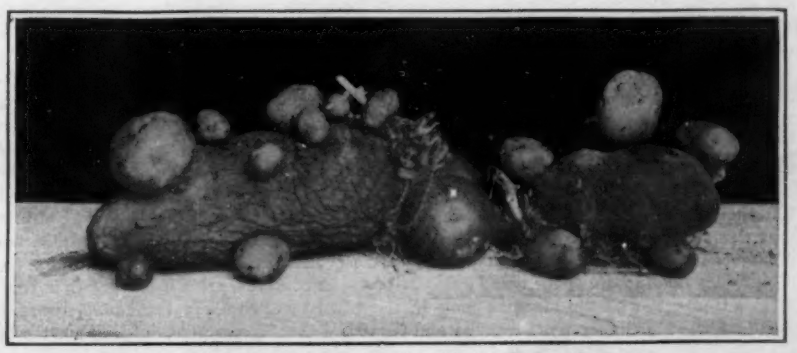
Increasing Production of Synthetic Nitrates

THOUGH the processes of making synthetic nitrates were invented prior to 1914 the industry has been enormously stimulated in Germany by the cutting off the supplies of Chilean nitrates, so that it is probable that even after the signing of peace, Europe will largely manufacture her own supplies of this fertilizer. The *Frankfurter Zeitung* recently published the following figures showing the annual production of artificial nitrates in Germany which strongly support these views.

1913	30,000 tons
1914	60,000 tons
1915	150,000 tons
1916	300,000 tons
1917 (estimated)	320,000 tons

What to Do With the Old Potatoes

TOWARDS the end of the season there are always a certain number of badly shriveled potatoes. Many of these are almost useless from the cooking standpoint but they may be turned to valuable account in the following manner. In most houses it is possible to discover some dry corner that is perfectly dark. This might be in a cupboard or a cellar. On a shelf or the floor spread a layer of dry mold an inch or so in depth and, into this, press the old tubers so that they are covered to about half their extent. See that each potato is quite distinct as it is rather important that they should not touch one another. Here the tubers may be left and they will require no further attention save a very occasional slight sprinkling of water. The soil should never be really damp or mold will be likely to appear. Some time during the summer little white spots will begin to appear on the potatoes and these will finally develop into small potatoes. When these are about the size of walnuts they may be gathered and cooked; they will be found to be altogether delicious. Strange although it may appear to be the old potatoes will go on producing the new crop for many months until there is nothing left of them save a little skin. The only essential feature of the treatment is that the old tubers be kept in total darkness. If any light can reach them continuously they will tend to send out shoots rather than the tubers that are desired.



Conserving old potatoes with the aid of a dark cellar corner

The War Activities of Our Technical Societies

What Our Organized Scientists and Engineers Are Doing for the Cause

By Calvin W. Rice, Secretary of The American Society of Mechanical Engineers

WAR is a science. In fact, it is one of the most complex of sciences. This has been recognized for ages, but in the present war it has become particularly evident. War in the air, war under the sea, war by means of novel surface machines, bombs and gases have all added to the complexity of the science. War has become a matter of complete military and economic organization, into which every man, woman and child must be massed. The sole thought and effort of the Nation in modern war must be concentrated on the business of making the war.

In this complete organization the technical men play not a small part, and it is, therefore, but natural that the several technical organizations representing them should be active. It is in fact through these organizations that the National Research Council has come into being. The Council is a body of about forty men, members of technical societies, who have in turn arranged themselves into numerous committees to study all realms of research, always in coöperation with or under the advice or control of the representatives of the various Departments of the Army or Navy under which such work comes. It is of interest to review the problems which have been taken up in this way.

The Council has coöperated in the establishment and organization of the submarine experimental work at Nahant, and has also established a very active submarine station at New London, another at San Pedro, Cal., and has been instrumental in the organization of groups working at New York, Chicago, and Madison, Wis. There has resulted a great practical advance in the art of submarine detection into which it is not desirable to go further.

The Physics Committee of the Council has distributed to various groups twenty or more large problems in physics, which are being actively worked upon, and some of which have already been solved. Among the latter are the location of aircraft by sound, the development of fire control for anti-aircraft guns, telephoning between airplanes, protection of balloons from ignition by static charges, and the development of new and improved methods of measuring muzzle velocities.

The Chief Officers of the Signal Corps of the Army have asked the Research Council to act as the Division of Science and Research of the Signal Corps, and in this capacity the Council has organized a Sound Ranging Service in the Signal Corps, and is now drawing specifications for scientific instruments to be used on airplanes. It has sent a dozen of the country's best physicists to France to aid the American Expeditionary Forces with their scientific knowledge; and is selecting a personnel of several hundred men who are to be engaged in the scientific services of the Army and Navy.

The Chemistry Committee has perfected an elaborate organization for the handling of all of the chemical problems which arise in the Army and in the Navy, and it has distributed some 150 chemical problems which are being attacked in the laboratories of the country.

The Psychology Committee has presented to the Secretary of War and the Adjutant General a vast program for the selection of officers from the reserve camps, and for the classification of drafted men. In fact it has called in most of the best known psychologists and employment experts of the country, and has organized them into a group in whose hands the War Department has placed the largest responsibilities regarding the examination and selection of men.

The Medical Committee has enlisted the services of a large number of medical men of the country, both in medical research problems and in the regular work of the Sanitary Corps of the Army.

The Engineering Committee has contributed in no small degree to the development of devices for the protection of ships from submarines. It has organized a large group which is now working on the development of steel protective devices for use of the soldiers at the front, and through coöperation with the National Advisory Committee for Aeronautics it has carried on extensive and important researches in the development of airplanes and airplane engines.

Turning to the work of the special committees of the Council, the Nitrate Committee has made an elaborate study and report which has been made the basis for the expenditure by the Government of large sums of money upon the erection of a nitrate plant.

The Gas Warfare Committee has had 120 chemists working for six months on the problems of gas warfare, and the results already attained have been of the utmost importance—so important that the Army and Navy have placed large appropriations at the disposal of this Committee for its researches.

The Optical Glass Committee by taking a dozen or more chemists from research activities like those of the Geophysical Laboratory and putting them directly in the big factories of Rochester and Pittsburgh, in six months' time developed in America the production of optical glass from nothing up to 20,000 pounds a month, and, at the present moment, the figure has multiplied two or threefold, while the product is beyond all comparison with what Germany was able to furnish four years ago.

The Psychiatry Committee has established abroad a laboratory for the study of shell shock.

The Foreign Service Committee, which the Council sent abroad at once upon the outbreak of the war, was wholly responsible for the sending back to this country of a French, English and Italian Scientific Mission, which brought with them the contributions which science had made to the war, in the matter both of instruments and of methods, and unquestionably saved months of time in putting the United States abreast of the European situation, as regards modern scientific methods in warfare. It is difficult to overestimate the stimulus to American participation in the war which resulted directly from the action of the Research Council in sending abroad at once the Foreign Service Committee, composed of seven of the best scientists in the country.

These things have been accomplished by the individual scientist, even though organizations like the American Society of Mechanical Engineers, the American Institute of Mining Engineers and the American Institute of Electrical Engineers have usually been responsible for making contact between the work and the worker. But things of equal importance have been done by the societies, acting as such. Twelve technical organizations, covering practically the entire field of pure and applied science, aided in the formation of the Naval Consulting Board. These same societies gave tremendous aid in the taking of our pre-war industrial census—for the greater part without expense to the Government. In connection with the Naval Consulting Board again, the societies and their more prominent members are passing upon an average of perhaps two hundred suggestions per day put forward by inventors and near-inventors, public-spirited citizens and cranks, all over the country. In spite of the opinions to the contrary put forward and spread broadcast by the worthy gentlemen who cannot be made to comprehend why their propositions of fishing for submarines with magnets or of building torpedo-proof barriers around our merchant ships have not forthwith been put into operation to bring the war to an immediate end, all such suggestions receive serious attention; and the labor involved is formidable.

The four big engineering societies were active in the movement which resulted in the legislation providing for the Engineer Officers' Reserve. The nation has, by this legislation, obtained and placed in military channels the services of thousands of the best men of the profession, and has thus augmented the staffs of every bureau of the Government.

Very early in the war, sensitive to the needs of the country, the same societies formed a Military Engineering Committee, the object of which was both to arouse the people to the necessity of preparedness and to instruct them in military tactics. A series of military lectures was given in the Engineering Societies' building, under the auspices of the Committee. The same Committee later supervised and financed a division of engineers for France.

No one society has had a more prominent or important part in war work than the Society of Automotive Engineers. It has not only furnished some of the most valuable volunteer men now in the Council of National Defense, but as a strictly technical work it has undertaken standardization of aircraft production, maintaining a suit of offices and a staff both in New York and Washington. The engineers who designed the wonderful Liberty Motor are members of the Society of Automotive Engineers, and this organization is also prominently represented on the Automotive Transport Section of the War Industry Board.

The American Railways Association, coöperating with the Chairman of the Advisory Commission of the Council of National Defense, has a Committee on Transportation, consisting of 28 railway executives. The American Railway Engineers' Association has published and distributed to all the members of the railway regiments in France a manual of recommended practice.

The National Machine Tool Builders' Association has coöperated with the Council of National Defense and the Aircraft Production Board, especially in the manufacture of the new Liberty Motor. A comprehensive list of all the machine tools in the United States ready for delivery was prepared and furnished the Government—one of the most tedious bits of war work of which we have heard.

The American Institute of Metals has coöperated with the United States Bureau of Standards in the preparation and inspection of non-ferrous metals, and has furnished many men for the Engineers' Officers' Reserve Corps.

The Illuminating Engineering Society has laid out the lighting schemes for the aviation cantonments which make possible night flying—an absolutely new problem. The society has also prepared industrial lighting codes for the Welfare Section of the Labor Commission of the Council of National Defense, besides doing very much

(*Concluded on page 596*)

Two Crops at the Cost of One

IF the man who makes two blades of grass grow where but one grew before is to be singled out in holy writ for special commendation, what shall we say of him who makes two entire crops grow where but one was previously raised? This greatly-to-be-wished-for consummation is actually being brought to pass in England, much to the delight of the London *Times* from which we abstract the following account:

In July, by use of a specially devised drill, a winter cereal and an artificial fertilizer are simultaneously drilled through the grass of land intended for haying the following year. By September or October this cereal will have made a top growth of ten or twelve inches. This is then grazed off, with the grass, by whatever live stock is turned out on it, the grazing process encouraging and strengthening the roots of the cereal. Owing to the protection from frost given these roots by their covering of turf, normal spring growth begins earlier, more heads are thrown up, development is more rapid, and the grain ripens simultaneously with the hay, both being harvested at the same time. This double harvesting is done at a single cutting by means of an ordinary mowing machine fitted with an extra knife at the proper height above the grass to cut the heads of grain. The lower knife cuts the hay as usual, and with it the lower section of the grain stalks. The upper knife acts as a header for the grain, while a carrier behind it deposits the grain heads in a separate swath from the hay.

The advantages of this method are many. The productive capacity of the land is, at the least, doubled; while not only are old and valuable grass lands saved from destruction, but they are actually improved. The economy of labor in plowing, harrowing and reaping two crops as one need not be dilated upon. Moreover, planting and rolling are also done at the same time, while the grain crop is gathered with ease and certainty, as there is no green growth with the grain needing to be stood in the sun to dry. The deep-rooted cereal takes up any washings of the fertilizers which have penetrated below the grass roots, thereby utilizing the fertilizer to the utmost of its potential value. The more uniform distribution, the higher percentage of germination of the July planting, the elimination of loss from birds and the impossibility of the heavy autumn rains washing the seed away all conspire to give a 50 per cent saving over the seed usually needed. The autumn grazing becomes of a fresh nitrogenous character, at a time when ordinary grazing has its lowest food value. The passage of the drills through the turf improves the surface drainage and the deeper-rooting cereal loosens the ground and adds to the humus in the soil. The equal mixing of straw with the true hay gives a better fodder. Planting in July is, in addition, a great convenience to the farmer who, having assembled his labor for haying, can use it for planting when the weather is unfavorable for the former operation.

It is claimed that under this method no permanent pasture need be broken up, but rather that the larger part of the arable land may be put down to permanent pasture. These permanent pastures are in hay and grain one year and grazed the next. In the spring of the grazing year seeds of the annual legumes can be planted through the pastures with the same machine used to drill the grain, not only on account of their feeding value, but also to increase the nitrogen in the soil for the following cereal crop. The drilling of the seed through the turf is accomplished by a small knife-bladed tool that can be attached to any drill in place of the disk. The experts of the British Government have been so impressed with the possibilities of the new system that priority certificates have been granted for the manufacture of the fittings, or the import of any parts or materials which cannot be obtained in England in time for the present season's planting.

There is no doubt that oats and wheat can be profitably grown in this manner. It may be that the stalk of barley and certain other grains would be too short above the hay for the header; but it is to be borne in mind that any grain will grow a taller stalk through the grass than when standing alone.

Correspondence

The editors are not responsible for statements made in the correspondence column. Anonymous communications cannot be considered, but the names of correspondents will be withheld when so desired.

Drafting Our Brains

To the Editor of the SCIENTIFIC AMERICAN:

Permit me to express my special interest in your most important editorial urging the protection of the research worker and that he be drafted into the laboratory rather than into the military arm of the Government.

We are fortunate in having in Washington a National Research Council and I feel sure that if the authorities wished to do so they could make an arrangement so that with the backing of this Council they could protect the interests of the Government and at the same time keep the promising research workers under the conditions most favorable to obtain results.

There is no question of slackerism associated with this problem. The type of man who has the wonderfully curious mind which is keen in research is almost sure to be the first to enter his country's service. The need is to have these men recognized by the Government, taken into the service and, as you suggest, definitely drafted to go on with their own work which is apt to be productive of such rich and important results.

I trust that you will continue your interest along these most vital lines and that they will not be lost sight of in the great confusion necessarily associated with our active participation in the war.

RAY LYMAN WILBUR.

Washington, D. C.

The Military Shotgun

To the Editor of the SCIENTIFIC AMERICAN:

I note with much interest an article in your issue of May 11th headed "The Shotgun's Debut as a Military Weapon" especially as I have been an ardent advocate of its use in this way ever since the Huns trampled underfoot all international conventions regarding the use of forbidden weapons in war. However, I am writing this letter to offer a suggestion which I am convinced will materially help in the use of pump guns especially in the hands of inexperienced men. Briefly it is put only five cartridges in the magazine instead of loading it to its full capacity of six. The reason for this is that with six the magazine spring is compressed so strongly that, if they are the least bit soft from being exposed to wet or even damp weather, the resulting pressure on them will flatten out the crimped ends and make a small burr or ridge which will very often jam the gun when you attempt to pump one of them into the breech.

(In writing the above I am assuming that the gun you mention is a new model and that you are correct in stating that the magazine bolds six cartridges as all the pump guns I have used carry five in the magazine and one in the breech. In any event however, the idea is to use one less than the capacity of the magazine.)

Possibly the manufacturers and some theoretical experts will "pooh-pooh" this idea but "believe me" I know whereof I speak. I have used pump guns of various standard makes, for 16 years and can,without conceit, say that there are comparatively few men who can empty one faster or more effectively than I can. I have used them under all conditions of weather and I can count on the fingers of one hand the number of times my gun has jammed on me while my hunting companions, who insisted on loading the magazine to full capacity, were continually in trouble, "cussing" their guns and threatening to throw them away. When they adopted my idea, however, their trouble stopped. Even when the shells are perfectly dry and hard it seems to me the gun works more smoothly when using this idea.

J. H. FORSGARD.

Galveston, Texas.

The 75-Mile Gun

To the Editor of the SCIENTIFIC AMERICAN:

I have before me your issue of April 27th, subject, "Velocity and Range of Guns" by J. Bernard Walker, which interests me very much. First, for the reason that I myself have designed various projectiles, and secondly because I have recently sent you sketches of a relay projectile.

Your article is very clear to me and no one can dispute the law in regard to velocities of shells, namely, that velocities vary inversely as the square root of the weight of the shells. With this law plainly in mind, I take exception to the possibilities claimed for the sub-calibered gun. I will assume as you did, that a 15-inch shell weighs 1,680 pounds and that the muzzle volocity is 3,100 f. s. and that the 9.4-inch shell weighs 420 pounds. To arrive at the muzzle velocity of the 9.4-inch shell, the square root of 1,680 is 41 and the square root of 420 is 20.5. Then, the velocity of the 9.4-inch shell, of course, figures at 6,200 f. s., *but here I take exception and claim the added velocity would be attained only provided the base area of the 420-pound shell had been left the same as on the 15-inch shell.*

We must take into account that with about twenty tons pressure to the square inch on the 15-inch shell, with a base area of approximately 177 square inches, we have the enormous pressure of 3,540 tons as against 1,380 tons on the 9.4-inch shell with an approximate base area of 69 square inches. It is plain then that *while the weight of the shell has been reduced, the exerting pressure as well has been reduced almost proportionately.*

It seems to me that the high velocity and consequent long range obtained from the sub-calibered gun, can only come from the use of the large powder chamber, which naturally will keep the pressure behind the 9.4-inch shell almost uniform from its original position in the gun to the end of the gun barrel. Then, of course, if length is added to the barrel, the gain will be very material.

C. A. MEILICKE.

Chicago, Ill.

(*Our correspondent very properly calls attention to the difference in total pressure on the base of a 15-inch and a 9.4-inch shell. It is true that the total initial pressure on the 15-inch shell is greater; but it must not be forgotten that the unit pressure produced by a given quantity of powder depends upon the volume. As the two shells move through the bore, the increase in volume for the same distance of travel is as 177 to 69, and the decrease in pressure is in the same proportion. Therefore, the pressure per square inch on the base of a 15-inch shell will fall more rapidly than it will against the base of 9.4-inch shell; in other words, the mean pressure, during the passage of the shell through the bore, will be higher in the case of the 9.4-inch shell.*

—EDITOR.)

Foucault Pendulum Experiment

To the Editor of the SCIENTIFIC AMERICAN:

Seeing an account of the above experiment as carried out by Mr. W. N. Collier in your issue Dec. 22, page 475, I was much interested and think as you do in footnote therein, the results he obtained were good; considering the crude method used in suspension of the wire.

Having had considerable experience with improved apparatus in carrying out demonstrations of this with great precision, permit me to advise your correspondent in any further trials he may undertake, to use silicon bronze wire in preference to iron or steel; these latter being subject to magnetism, form a couple with the permanent magnetism of the earth, and so tend to swerve the pendulum from its fixed plane of swing. This is one objection thus easily overcome. Another and more important one is the method of suspension which should be entirely free to sway in any given direction and equally so. This can be accomplished by a rocking action of a shallow cup-shaped surface of polished agate, or other hard stone, set in a metal spring to which the wire is attached forming the pendulum together with the bob. The said shallow cup polished surface resting on a fixed conoid of hard steel completes the suspension. I have also made and employed an apparatus in connection with this to maintain the swing for any length of time to its full arc, the length of this being 12 feet showing the degree divisions of the scale well open, fully 1¼ inch apart thus easily read by the observers.

Two demonstrations have been carried out, some time back, with these improvements, for two hours at a stretch, showing the calculated angular change correct during this time, within one minute. The pendulum plane remained quite straight.

Full particulars of the above and description of the apparatus may be found in the *English Mechanic*, Vol. XCIV, No. 2436, page 418.

Should I ever be induced to give another demonstration a long swing from a roof, say 100 feet high, with an arc of 20 feet across, would form a pleasing spectacle.

G. WHITTLE.

Liverpool, England.

Trench Fever

THE disease trench fever, as is well known, has been a scourge of all armies since the present war began. Its ravages have been appalling, and it has been responsible for a high rate of sickness, even though it is not in itself a dangerous disease as far as life is concerned. Many efforts were made to cope with the disease, but until recently no success attended them. The Medical Department of the British War Office, however, was determined to deal with the matter, and spared no pains to organize research into it—thus continuing a policy which has won for this branch of the service the esteem and thanks of the whole nation. Sir David Bruce was asked to form a committee, and gathered about him a number of eminent scientific men. The actual work on the patients was carried out by Major Byam, who, with a staff of experts, went to work at the New End Hospital, Hampstead, commanded by Lieut-Col. T. S. Allan, R.A.M.C., British army.

For the purposes of the work it was necessary that volunteers willing to be infected with the disease should be obtained. It is a matter for pride that no difficulty was met with in this direction, for as soon as the need was made known many offered their services. Some of these were ex-service men whose desire to fight in the army or navy had not been gratified. They declared that at least they would now have a chance of doing something for their country.

How much they were able to do was made clear by the brilliant researches carried out. In the first place it was suspected that lice were the carriers of this disease. But it soon became clear that the carrying powers of the lice were more complicated than had been suspected. For example, a man might be bitten by many lice which had previously fed on trench fever patients, and yet not get the disease. This fact led to the idea that possibly it was the excreta of the lice, and not their bites, which conveyed the disease—the means of entry of the poison being provided by the scratching of the patient. This theory was tested and proved to the hilt. In every case in which lice excreta was scratched into the skin the patients took the disease in a few days. The importance of this is evident when it is remembered that lice abound in the trenches, and their excreta are blown about, as a fine dust, everywhere. It afforded an explanation of the origin of trench fever occurring among persons handling, for example, soldiers' clothing, and also suggested the possibility of an infection of the civil population a distance from the firing line. Even if no lice were present the excreta remained virulent if brought into contact with cuts or scratches.

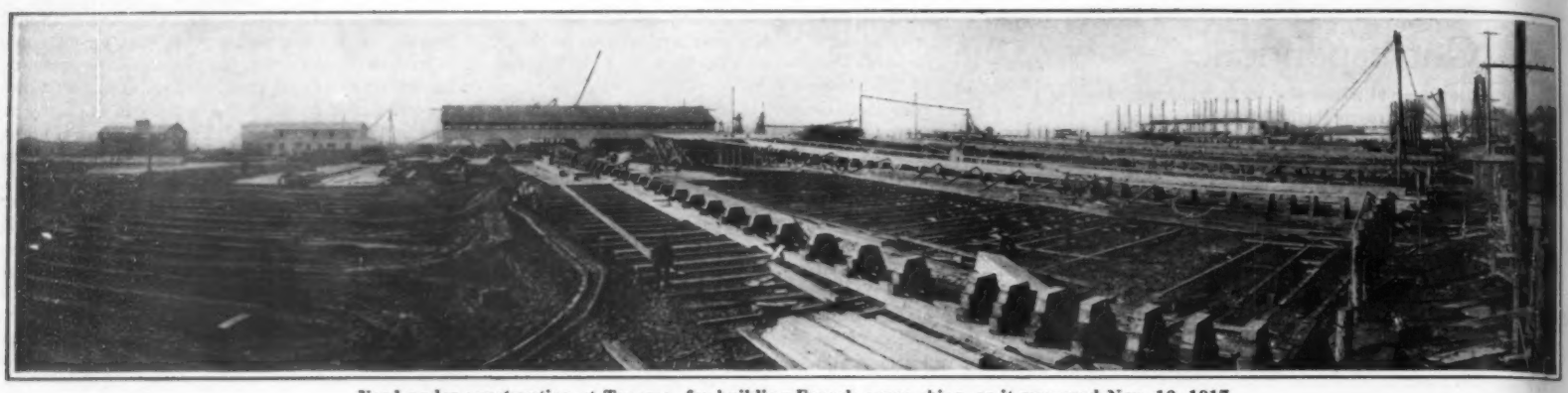
Again, it was found that for a week after feeding on a trench fever case a louse was not infected—or rather its excreta were not infective. After a week, however, it became infective, even if it had fed only once on the patient. Probably, therefore, the germ of this disease passes through a part of its life cycle in the body of the louse, as malaria does in the mosquito, and until that period is completed the disease is not spread. The importance of this from the point of view of preventing the spread of the disease is obvious. Indeed, it was proved that the amount of heat sufficient to kill lice is by no means sufficient to rob the excreta of its virulence —that is to say, louse-free garments may still be highly infective owing to the excreta contained in them.

Among the complications sometimes arising out of trench fever under field conditions are "soldier's heart" and neurasthenia. Major Byam was able to announce that some very important observations on this aspect of the matter had been made and methods of treatment devised. In this special branch of the work, he said, American medicine was represented by Capt. John H. Carroll, U. S. A., and the research was likely to throw a new light on the vexed question of the genesis of soldier's heart. King Edward once very shrewdly asked, "If a disease is preventable, why is it not prevented?" Here was an opportunity for the blotting out of an important war disease. Just as Malta fever was blotted out in Malta by a single blow, so could this disease be blotted out of armies. All that was wanted was to prevent the louse getting to the soldier. This could be done if all branches of the service, combatant as well as medical, put their backs into it. It was a matter which touched closely the officers of the regiment or other units. The amount of sickness due to the attacks of skin parasites was put down at from 60 to 90 per cent. When the combatant ranks recognized this great wastage in man-power they would be the first to put all their efforts in to combat the plague.

Posters to Win the War

AN interesting feature of the present war has been the way in which it is put before the public through the medium of posters. We have had all manner of these: posters to stimulate enlistment alike in general and in particular branches of the service, posters to sell bonds and stamps, posters to tone up the general spirit of the nation and to keep the workers working and the fighters fighting, posters to push shipbuilding and food-saving and Red Cross giving and every form of collateral war activity. In all the major warring nations, the poster has been an effective means of appealing to the public to support the war.

Some of the posters have been good, some bad, most of them indifferent—a select few have been strikingly successful. With a view at once of getting good posters and of clarifying the fundamentals of poster effectiveness, the Emergency Fleet Corporation has announced a prize campaign for posters to speed up ship construction. The prizes aggregate a thousand dollars, and the awards will be made in four classes—open to everybody, open to enlisted men only, open to shipworkers only, and open to pupils in the elementary and high schools only. A detailed statement of the simple conditions governing the contest has been prepared, together with a pamphlet elucidating the principles of poster design, so far as they have been elucidated. These will be sent on application to the United States Shipping Board Poster Competition, care of the New York *Sun*, 150 Nassau Street, New York city. The competition, it may be here stated, closes on July 28th.



Yard under construction at Tacoma, for building French cargo ships, as it appeared Nov. 13, 1917

Wooden Ships Versus the Submarine

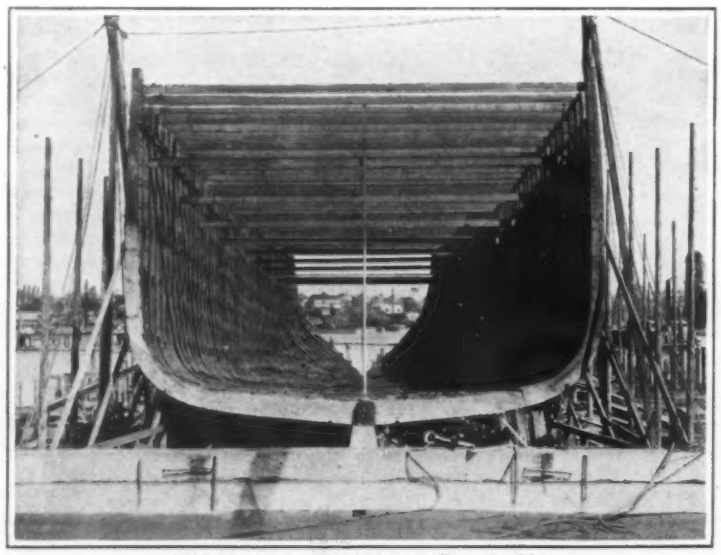
Description of Various Types of Wooden Ships Building for Ourselves and the Allies

ALL the Allied countries engaged in the great war have performed amazing feats of construction, in respect both of the magnitude of their operations and the speed with which they have been put through. So far as the United States is concerned, it is probable that the upbuilding of our merchant marine will stand out in the future history of the war as our greatest single industrial achievement.

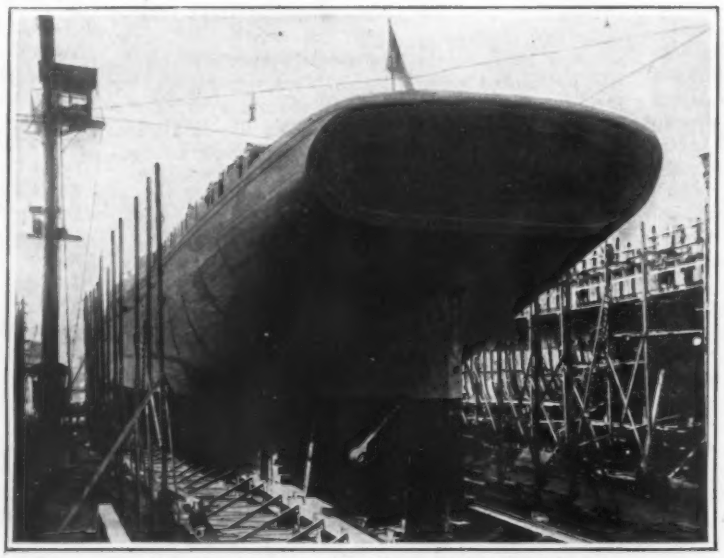
On the editorial page will be found a digest of Mr. Hurley's own statement of what the Shipping Board is doing and expects to do; and in the present article an attempt is made to show, suggestively, in the case of a single corporation on what a scale of magnitude and speed the ships are coming forward. It is about one year ago that the Foundation Company were equipping their first shipyard for the construction of 10 ships which they had under contract for the United States Shipping Board. Today, they are operating four yards on the Pacific Coast, three on the Atlantic Coast, one on the Gulf and one on the Great Lakes. They have under contract for the United States, British and French Governments a total of 98 ships varying in size from 4,250-ton cargo boats down to 150-foot mine sweepers. Already a dozen of these ships have been launched, and others are coming along at the rate of about ten per month.

When we entered the war and the Government decided to build a large fleet of wooden ships, the voice of the croaker was heard in the land. He told us that shipbuilding was a very special art, demanding carefully trained craftsmen of long experience. He told us, that, since the craft of wooden shipbuilding was practically extinct, and the shipwrights were either scattered or dead and buried, it would be absolutely impossible to get together the skilled staff of men who alone knew how to build wooden ships. Now the public has a decided appetite for scarehead sensationalism, and the first wave of enthusiasm over wooden shipbuilding was followed, thanks to these dismal prophets, by a wave of depression.

These people had forgotten that invention and adaptability were essential elements in the American make-up. Designs for wooden ships were drawn, which called for a minimum of handwork with the adz and the axe. Some very ingenious woodworking machinery was developed which was able to saw out the heavy framing timbers, true to templet, in a single operation; and so it has come about that the things which the prophets of failure predicted could never be done is being done, and a vast fleet of wooden steamships is coming forward on the stocks and being set afloat at an ever increasing rate of speed. The problem was one of adjusting existing facilities and machinery to new work, and directing the energies of the American workman into new channels.



Midship frame of a 3000-ton French ship



Launch of French S. S. "Commandant Rosin"

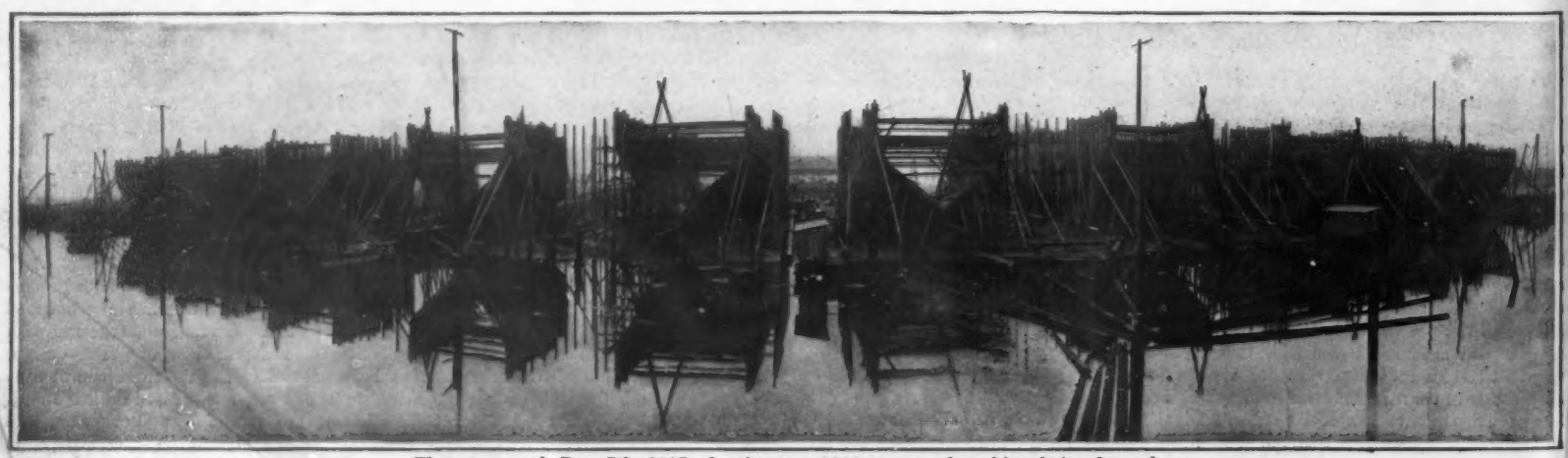
In the case of the Foundation Company, for instance, there would seem to be little connection between the sinking of pneumatic caissons for deep foundations and the building of ships; but the company, when the war started, already possessed an organization of experienced ship carpenters and caulkers, which gave them the nucleus of their first shipbuilding forces. In spite of the difficulties and novelty of the work, it was rapidly organized on a vast scale.

In a few months' time the company not only developed shipyards from vacant sites but established a number of notable records in the construction of vessels.

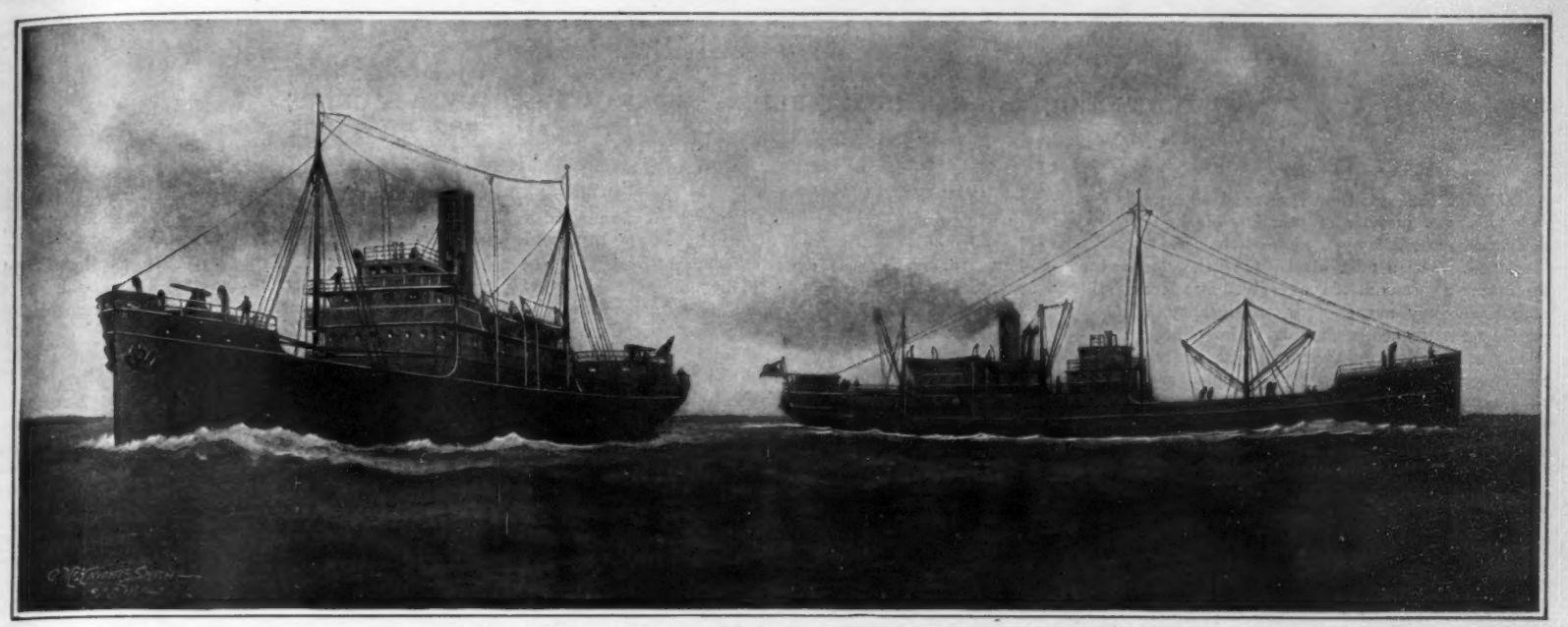
Photographic evidence of the rapidity with which wooden ships may be built is shown in the two views of the Tacoma yard of this company taken on November 13th and December 7th. During this 24-day interval the frames of ten 3,000-ton ships were set up to the extent shown in our illustrations. These vesselt are being built for the French Government from designs by Cox & Stevens, naval architects of New York.

As will be seen from our illustrations, showing the ships in various stages of construction, and under full sail, these are really handsome craft with very sweet and fair lines. Their dimensions are: length over all, 280 feet; length between perpendiculars, 250 feet; extreme beam, 45 feet, 6 inches; deadweight capacity, 3,000 tons on a draft of 23 feet. They will be driven by two, 350 horse-power, twin, steam engines at a speed of nine knots; and under sail and steam their speed will be several knots more, according to the weather conditions.

In the same picture with the French auxiliary steamer we illustrate a 150-foot single-screw, steel, mine sweeper of which 38 are being built by the same company for one of the Allies. The length of this vessel between perpendiculars is 140 feet; beam 25 feet; depth of hold, 14 feet, 7 inches; draft, 14 feet. This little vessel belongs to that staunch type of smaller craft which has done such wonderful work against the submarine and the mine. Her design is based upon the experience



The same yard, Dec. 7th, 1917, showing ten, 3000-ton, wooden ships, being framed

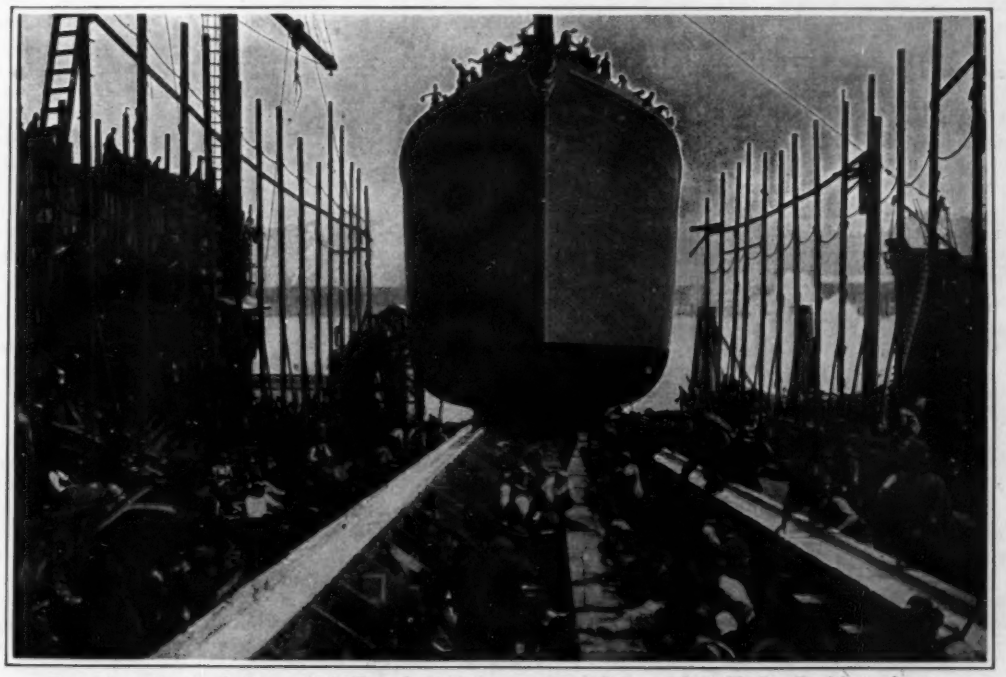


Ferris type 3500-ton ship for U. S. Shipping Board. (Right) 2800-ton type building for British Government

Types of wooden ships building for the United States and the Allies

already gained during four years of war. She has good free board, ample gun power, and is driven by a triple-expansion engine supplied by a single Scotch boiler. The speed will be about 10 knots.

Another of our engravings shows two other types of ship now building—one for our own and the other for the British Government. The first of these, known as the Ferris ship, was designed by Theodore E. Ferris, who was at that time the designing architect for the Emergency Fleet Corporation. The dimensions are: length over all, 281 feet, 6 inches; extreme beam, 46 feet; molded depth, 26 feet; dead weight carrying capacity, 3,500 tons on a draft of 23 feet, 6 inches. She is provided with engines of 1,400 horse-power, which will give a speed of about 10 knots. The Foundation Company made an excellent record in competition with twenty-three other shipbuilding yards which are building the same type of ship, when, on March 19th of this year, they launched the "Coyote" at their Passaic River yard. This was the first of the Ferris type to be launched for the United States Shipping Board on the Atlantic coast. The other ship shown in this engraving is a single deck, extended poop type of wooden cargo steamer, designed by the Imperial British Munitions Board. A fleet of these vessels is being built for the Munitions Board in various shipyards on the Pacific coast; and although the Foundation Company consumed several months' time in clearing a site and equipping a yard at Victoria, B. C., they were the first to launch a vessel of this class.

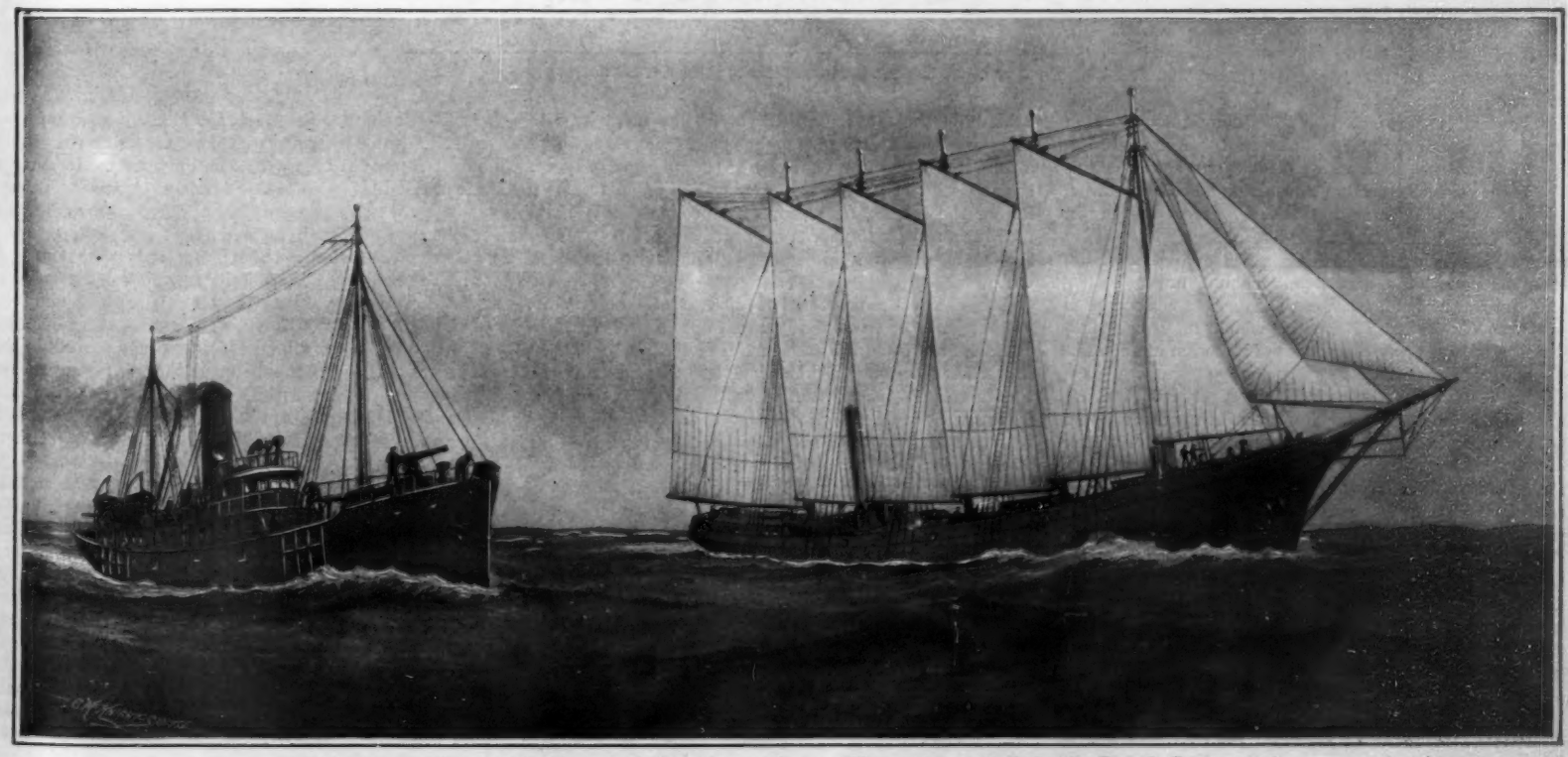


Launch, at Portland, Ore., of the French 3000-ton steamer "Commandant Challes," with workmen laying keel of next ship in 11 seconds

The latest record of quick work comes from the Portland yard of the Company, where a new keel has been laid and trued up, 11 seconds after the launching of a ship from the same ways. After the launching of the first ship it took 20 minutes to lay the new keel; but this time was cut at later launchings to 16, 6½ and 2 minutes, and finally to 11 seconds.

One of our illustrations shows how this record was accomplished. The new keel was laid on skids at one side of the keel blocks under the hull to be launched. As the stem of the ship cleared the ways, gangs of men hauled on ropes and others piled over the ways to help push the new keel into place.

As samples of the shipbuilder's art the new wooden vessels are a match for the best of the earlier days.



Steel mine-sweeper, 150 feet long, and 3000-ton, wooden, auxiliary steamer, both for the French Government

Ergotism

An Interesting Human and Animal Disease Caused by a Fungus

By Albert A. Hansen

A SHORT time ago the writer received a package containing a number of peculiar, black, horn-shaped grains accompanied by a request that the "seeds" be identified. The sender stated that the "seeds" contaminated a shipment of rye received at a local distillery and, since they were new in the locality, he thought possibly a new weed might thus be introduced.

The so-called "seeds" were immediately recognized as being hardened fungal masses called ergots; hence they are in no way to be compared to seeds. Popular knowledge concerning these grains is extremely erroneous; they are usually regarded as seeds. Many farmers are firm in the conviction that they are degenerate grains of the grass upon which they are found. The ergots are very dangerous since they contain a poison which may prove fatal to either man or beast. The disease resulting from the eating of ergot is called ergotism; in man it is sometimes called raphania. History records many glaring examples of death due to this fungus, examples recorded from the days when the Roman Empire was at the height of its glory, down to the present time. Epidemics of ergotism seem to indicate that climatic conditions influence the spread of the fungus. France, Germany, Spain, Sweden, Switzerland, and more recently the United States have all suffered from plagues attributed to ergotism, the epidemic visiting France in 1816 being particularly severe upon both animal and man. Of late the disease does not seem to be so serious as in former times, although one of our western states was visited with a severe outbreak as recently as 1884.

The fungus which causes the formation of ergot grains is very widespread, occurring in practically all parts of the country and attacking a large variety of grasses, particularly rye. Wheat, timothy, redtop and many of the wild grasses may be afflicted with the disease. An investigation into the life habits of the fungus reveals many interesting facts. In the first place, the infection is primarily a sexual plant disease, since only the ovaries of the flower are affected. In order to secure widespread distribution of its spores, the fungus which has infected a young ovary resorts to the interesting expediency of secreting a sweet, sticky "honey-dew" which is eagerly devoured by flies and other insects.

This sweet secretion serves the two-fold purpose of attracting insects and affording a means by which the fungal spores are caused to adhere to the insect's body, thus securing an effective means of disseminating the spores from flower to flower and causing a rapid spread of the disease in the spring of the year. Gradually the infected ovaries are replaced by the hard, compact, ergot grains, purplish-black on the outside, but with lighter colored interiors. They become many times larger than the seeds, resembling miniature boomerangs projecting from the head of the infected grass. They may vary in length from one-quarter to one and one-half inches. If a few of these grains are collected and buried about a half-inch in the ground until the following spring, an interesting phenomenon will occur. From each ergot, numbers of small mushroom-like structures, usually from a quarter to a half inch high, will shoot up during early spring. This experiment should never be attempted in the field, since each tiny, rose-colored head produces thousands of spores, which may be wind-distributed and prove the source of infection of an entire crop of grass or grain.

The ergot grains contain a drug, ergotine, which, although a violent poison, finds use in medicine. If a field is badly infected, the fungus may be made a source of revenue by collecting the ergots and offering them for sale to wholesale drug houses. Bread made from ergotized flour is the commonest source of danger to man, death from this cause being by no means a rare occurrence. Cattle feeding upon ergotized fodder will eventually succumb to the attacks of the disease. The poison is cumulative, the symptoms developing usually in the spring and sometimes in the winter.

One peculiar action of the poison is the effect upon pregnant animals, abortion being frequently produced. Diseased animals may shed their hair or lose their tail-tips, ears, teeth, or hoofs. The effect on the hoofs caused the epidemic of ergotism which broke out in Kansas in 1884 to be at first attributed to the foot and mouth disease. In birds, the loss of the beak may be due to ergot poisoning; the comb and tongue may also be effected. Death may eventually ensue from exhaustion. When the disease becomes chronic, treatment is usually of no avail to the unfortunate victim; tannic acid may prove helpful, however, and is the medicine usually prescribed for cases of ergotism. The losses from ergot poisoning are said to be considerable in the United States, particularly in stock raising communities in the central and western states.

The writer is not familiar with the effect which would be produced in liquors distilled from strongly ergotized grain such as was sent for examination and which suggested the writing of this article. It is possible, however, that if sufficient of such liquor is imbibed, a permanent cure for the liquor habit will result, for the indications are that such a practice might end fatally. It should be stated that large single doses are necessary to prove of great harm.

Surely the poisonous nature of structures which are as common as are ergot grains, should be understood by all and especially by the farmer who may have ergot in his fields. Such ill founded theories as the degenerate seed conception of ergots should have no place in the mind of the up-to-date farmer, although this notion seems to be prevalent among farmers at the present time. Badly infested crops should never be used for hay, pasture or flour; such a practice may prove exceedingly dangerous. If the disease has gained a foothold upon the crop, the field should be burnt over to destroy the pest. One farmer has been reported as losing a thousand tons of hay because of the presence of ergot. It is possible that grasses growing in waste places may harbor the fungus, thus proving a prolific source of infection from year to year. Such waste places, of course, should receive the immediate attention of the agriculturist.

The ancient name for the disease ergotism is St. Anthony's fire, a name rarely applied at the present time. It should be stated that the fungus is apparently becoming scarcer because of improved agricultural methods; but in regions such as the interior provinces of Russia little has been done to check the disease. The demand for ergot grains by the drug houses seems greater than the supply; the shortage is so acute that wholesale druggists are actually considering the advisability of cultivating the fungus.

It must not be inferred, however, that the disease no longer occurs in the United States. Recent work by Brown and Ranck on the poisonous action of a species of ergot on Paspulum grass, led J. B. S. Norton to work upon the same subject in Maryland. During the summer of 1902, the fungus was found to be very abundant in the State of Maryland; a farmer sent a sample which he had taken from a field in which cattle had died with symptoms of poisoning. To quote from Norton's work, which appeared in *Science*, "The *Claviceps sclerotia* (ergot grains) which replace the Paspulum grains are frequent in Maryland nearly every year, though in some years almost absent and sometimes, as in 1915, unusually abundaat."

A potential source of danger, such as these ergot grains have proven themselves to be, should be so familiar to every farmer as to be readily recognizable or the consequences may prove serious.

Mature ergot grain in rye

Ergot grain, showing characteristic boomerang shape

Ergot grain germinating

The black masses on this spike of beach grass are ergot

Eat Corn

ABOUT three-fourths of the world's corn crop is produced in the United States; but considerably less than one-tenth of that production is used as human food. One-fifth of our total corn crop, or about one-third of what is suitable for milling would, if used as human food, set free all the wheat needed for our boys in khaki, our boys in blue, and all our Allies in the regions where the world is now being freed of Hun domination.

In demonstration of the truth of these statements, Professor of Food Chemistry H. C. Sherman, of Columbia University, experimented on four healthy adults, none of whom had been accustomed to any considerable use of corn as food. Their bodies used the corn meal proteid (the tissue building material in the food) as well as if an equal quantity of wheat flour had been consumed. Three of these volunteers did experience some slight digestive disturbance, due perhaps to ill prepared meals or possibly to the effect of the bulky and starchy diet during the hot weather when the experiments were made. The fourth heroic soul disposed of an enormous quantity of corn meal, baked into thin scones, a form much more thoroughly cooked than is mush. He showed no disturbance of appetite or of digestion, though he assimilated daily ten ounces of corn meal besides considerable milk, fruit, sugar and fats. In this latter experiment the corn displaced the whole of the amount of breadstuffs and cereals ordinarily eaten—and that for a month's steady diet, the protein equilibrium and the bodily weight having been maintained throughout at normal; the corn furnished half the calories (heat units), and three-quarters of the necessary protein.

Corn meal suitably prepared and cooked can, for most people, be substituted for corresponding wheat products, without detriment to health or to proper bodily nutrition. For his test meals Miss Monroe of the New York Association for the Improvement of the Poor, furnished Dr. Sherman with menus for 21 meals (seven days), the reading of every one of which would make the mouth water. But will not the continuous use of corn result in pellagra? Not if other foods of the right kind, milk especially, are taken at the meals. The fact is, wheat and maize are very similar products as to their dietary essences. Let us then, eat corn, save wheat and thus help to end the war.

Use Sodium

BEFORE the war we were dependent on Germany for some things which many of us considered we could not get in any other way. The only reason for such a state of mind lay in sedulous "Made-in-Germany" propaganda, by which so large a part of our people were taken in. For example, we have ample natural deposits of potassium compounds, though not at present in such form as to be easily adaptible for technical or commercial use. However, American chemists, since our embargo was laid on Germany, have been investigating our own potassium capabilities, and are developing favorably the industry in salts of that substance, though, for some time to come, the product will not suffice for our urgent needs.

There is an adequate substitute for potassium. Potassium and sodium are sufficiently akin to be used interchangeably.

The Chicago *Chemical Bulletin* observes that sodium should be superior to potassium salts for many purposes, notably in medicine. And yet, we continue to buy an inferior article at high prices, while we refuse something superior though offered at reasonable cost.

Let us then get the habit of using sodium rather than potassium products. Potassium have no advantage over sodium medicaments, while the latter are indeed in some instances more salutary. Potassium acetate is $2 the pound, sodium acetate 62 cents; potassium bicarbonate is $1.28 the pound, sodium bicarbonate 5 cents; potassium bromide is $1.93 the pound, sodium bromide 86 cents; and so on.

The Chinese Puzzle of the Aerial Photographers

WHY do aerial photographers risk life and limb in order to obtain photographs behind the enemy battle-front? Simply because these photographs when pieced together go to make an up-to-the-minute map of the enemy's country; and to know what the enemy has done and is doing is a prerequisite for a successful offensive or defensive operation.

The work of piecing aerial photographs together calls for no mean ability; in fact, special men are detailed to this all-important task. As will be noted in the accompanying illustration showing a British staff man at work on what appears to be a Chinese puzzle, each photograph is pinned in its proper place on a piece of cardboard carrying a rough sketch of the region concerned. Obviously, aerial photographs are taken under such adverse conditions that each view cannot be made with mathematical precision, and for that reason photographs must needs overlap one another. Again, they are not taken all to the same scale, because of variations in altitude. However, with great patience and greater skill the staff members assemble the hurriedly-made prints into a living map of the enemy's lines and back areas for the use of the general staff and artillery.

Copyright, Underwood & Underwood

Assembling aerial photographs into a living map of the enemy's positions and back areas

Why Soldiers Fight With Smoke

SMOKE is a valuable weapon in this war. In military as well as in naval tactics it is largely employed to conceal one's movements from the enemy. That, no doubt, is the better known of the two uses for smoke. The other and lesser known use is as a protection against poisonous gases.

The Allies and the Germans have given considerable attention to smoke clouds, and methods for producing them quickly and efficiently are now highly developed. Both sides make use of a large variety of gas producers ranging all the way from simple hand cartridges of the "fumigene" type of the French army to the smoke shells and elaborate smoke generators. Smoke clouds can be produced in the space of a few minutes, affording an effective screen for artillery and troop movements.

During a poisonous gas attack smoke is employed to ward off the fumes. Being considerably heavier than the poisonous gases generally employed, a barrage of smoke causes the dangerous fumes to pass over trenches and dugouts and to dissipate themselves in the higher regions.

From the reports now coming back it appears that the Germans and Austrians have been making full use of smoke clouds in all recent offensives to mask their troop movements.

Copyright, International Film Service

French soldiers making use of the "fumigene" or smoke cartridge to mask infantry movements

An Armored Gasoline Horse for Our Artillery

HORSE-DRAWN artillery is fast becoming obsolete. Instead of being hauled by a team of horses lashed to a frenzied and wild gallop by equally frenzied artillerymen, the battery of today goes to battle behind a chugging and lumbering, but withal efficient, tractor. And so it is with the United States field artillery.

The new five-ton armored artillery tractor which the United States ordnance bureau has adopted for transporting field guns is shown in the accompanying illustration. It is said to have the climbing ability of the well-known "tanks," can cut down trees, and ignore fallen logs; in fact, it can waddle over the roughest kind of terrain and through what have heretofore been the most discouraging obstacles. The machine and a 4.7-inch field howitzer weigh together about 20,000 pounds. The tractor is shrapnel-proof and can be disabled only by a direct shell hit. Field guns from three to six-inch caliber will be drawn by this method, as well as larger guns.

The Current Supplement

A SUBJECT of enduring interest is the physics of the universe which presents a vast number of problems of the highest importance for study and solution. In the current issue of the SCIENTIFIC AMERICAN SUPPLEMENT, No. 2217, for June 29th, will be found a short paper on *The Relations of Matter and Ether*, which presents a simple conception of the evolution of matter. *Monument Mines* gives some facts in relation to the source of the fine granite that is so largely employed for monumental work of various kinds, and it is illustrated by a number of photographs showing some unusual quarries from which the material is obtained. In the early days of artillery all of the projectiles used were made by casting, but later on steel forgings practically supplanted cast iron for this purpose. Because of the necessity for turning out the vast numbers of shells required by the allies in the shortest possible time, recourse has again been had to the casting process, and it is now extensively employed in making some descriptions of shells with considerable success, the material used being what is known as semi-steel. Much valuable information on this subject will be found in a paper on *Making Cast Ammunition in France* by a French metallurgical expert. After a big tree is felled in the forest it becomes an important problem how to cut it up into lumber most economically, for the old-time wasteful methods are not now countenanced in the lumber industry. A diagram in the present issue shows how the sawmill man solves the problem not only to secure the greatest product from his logs, but to turn them into lumber best adapted to the uses to which it will be put. A page of unusual photographs illustrates in an interesting manner *The Vanishing Art of Ivory Carving*. *The Sun's Position and Rotation* tells of some facts bearing on the question, the past and future positions of the sun in the universe. It is illustrated by a number of diagrams. Other articles of importance in this issue are *Locating Submarine Faults; The Origins of the Chinese; Conserving Mechanical Ability; The Manufacture of Tin Plate; The Sunflower* and *Animal Life at the Front*. The *Index* for the volume of the SUPPLEMENT now completed will be found in this issue.

Copyright, Harris & Ewing

Nothing short of a direct shell hit can put this U. S. armored artillery tractor hors de combat

American Battleships in Europe

FOLLOWING the announcement by the Navy Department of the names of the American Admirals who are on duty in Europe, Rear-Admiral Gleaves has recently made a reference to the ships they command, which puts beyond all doubt the fact that our Navy is represented in European waters by a division of our dreadnought fleet. He told his audience that during certain war maneuvers, presumably in the North Sea, Admiral Beatty, as a matter of courtesy placed a division of United States battleships at the head of the British line. Now since the British battleship line is made up entirely of ships of the dreadnought type, it is a pretty safe guess that the four ships that flew the American flag on this historic occasion were dreadnoughts—probably of the latest design. So far as gun-power is concerned our dreadnought fleet may be divided into two broad classes, according to the gun which forms the main armament. Among the earlier ships, mounting the 12-inch gun, we have the "Delaware," "North Dakota," "Florida," "Utah," "Arkansas" and "Wyoming." The ships that carry the 14-inch guns are the "New York," "Texas," "Nevada," "Oklahoma," "Pennsylvania" and "Arizona." It is a pretty safe guess, that if the Germans ever line up against our fleet in the North Sea, it will be 14 and not 12-inch shells that will land on their ships. This combined Allied fleet should be able to give a good account of itself in any action with the enemy. We hope so, at least; for when Trotsky and Lenine sold the Russian army to Germany—they sold the fleet as well, thereby adding four dreadnoughts and four battle-cruisers to their strength in the North Sea fleet.

Wanted—Officers for Submarines

THE attention of young men is repeatedly being called, these days, to the fact that the abilities of technically trained and experienced men can best be put at the service of the country by selecting a branch of the service in which their special qualifications will be of the greatest use.

The submarine force of our Navy requires the services, as officers on board submarines, of young men who have had technical training in mechanical and electrical engineering and who have had some experience in these professions. It is intended to enroll a number of such men as provisional ensigns in the Naval Reserve Force, giving them a course of instruction in deck duties at Annapolis and a course in submarine work at New London. Those who pass these courses successfully will then be sent on board the subs for regular duty.

Candidates for this service should have a degree of M. E., E. E., or E. M., with two and a half years practical experience in the profession; they should be not over 35 years old, and physically strong and sound.

Such men may forward their names to the Commander, Submarine Force, U. S. "Chicago," care Postmaster, New York; and if possible they should receive the endorsement of the Naval Consulting Board, the National Research Council, the A. S. M. E., the A. I. E. E., or the A. I. M. E.

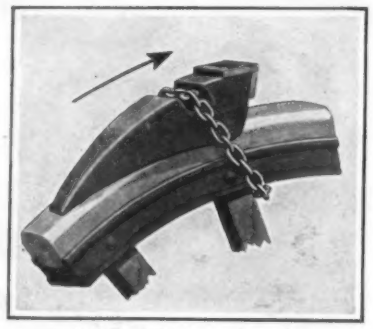
Inventions New and Interesting

A Department Devoted to Pioneer Work in the Arts

Motor Truck Emergency Spud

THE mud of the Flanders and Somme battlefields is largely responsible for the invention by Lynch of the "emergency spud," which is shown in our two engravings. So bad are conditions on those battlefields in rainy weather, that it is a common sight to see motor trucks with their wheels buried to the axles. Under such conditions, they will simply spin in a mud pocket and traction is impossible. The traction device herewith shown is very simple and its form and method of application are easily understood from our illustrations. The spud is placed on the tire and a short length of chain is passed around the rim and the spud and coupled up. So great is the grip of this device, that it immediately takes hold, and will lift a truck bodily out of the pockets which the rear wheels have formed for themselves in mud or clay material.

Emergency spud for motor trucks



Enlarged view of spud

A Lifeboat Designed Like a Submarine

BY applying the general design of the submarine to a lifeboat, an inventor has recently evolved a most serviceable form of craft. In fact, the result is the Brude combined lifeboat and liferaft, which was demonstrated off the Battery in New York city a few weeks ago.

The Brude craft, which is shown in the accompanying illustration, is covered over, and in general appearance is suggestive of a small submarine. It is provided with conning-tower and a hatch, as well as a mast and sails. Besides being unsinkable, this lifeboat is non-capsizable and non-swampable. The boat has demonstrated its complete utility by crossing the Atlantic Ocean in 87 days during mid-winter, which not only speaks volumes for its navigating properties, but demonstrates how the occupants are guaranteeed against exposure.

Copyright, Underwood & Underwood

This lifeboat and liferaft cannot be capsized even under the most adverse conditions

A Flexible Mold for Pipe Joints

THE accompanying illustrations show the method of using a unique flexible mold for pouring cement sewer-pipe joints, as designed at Columbus, Ohio. This mold can be used in close places, where it can be drawn about the bell and spigot with ease. It is only necessary to dig a trench wide enough for a foot on either side of the pipe line. It is not necessary to work around the joint, for when the form is tightened about the bell and spigot there need be no further worry as to the bottom and sides of the joint being properly formed when poured. The form consists of segments strung together on two flexible cables, each of which tightens up independently by adjustment of the thumb screw in the latch.

A ring of oakum is calked well into the bell to prevent the grout from flowing through into the line and congesting the sewer, the rest of the joint section being of the cement grout. The design of the joint, crowning out and over the bell, not only seals the porous edge of the bell, but the clinging surface is likewise increased. The extra body of joint material outside the bell acts as a gate in regulating the flow of the liquid material around and in the bell, and also increases considerably the strength of the joint.

On the whole, it would be difficult indeed to imagine a more satisfactory solution of the problem of dealing with a pipe joint in cramped quarters.

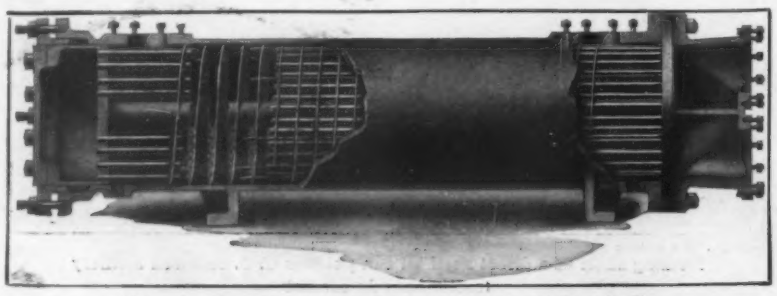
The flexible concrete mold for pipe joints, and the manner of its use

A Merry-Go-Round Oil Cooler

IN the past few years the cooling of lubricating oils for use in turbine bearings, reduction gears, and similar heavy duty work, and of oil used in quenching metal after heat treatment, has received considerable attention from engineers. It has become imperative to devise a means of cooling these oils so that the same quantity of oil can be used over and over again without serious delay for cooling, and so that the oil can be maintained at the proper temperature to secure the most efficient operation.

After some years of study and experiment, a large manufacturer of engineering equipment has recently placed on the market a device intended to meet this demand. As our cut shows, this device is of the type which forces the fluid to be cooled through a cylinder, inside which it comes in contact with tube surfaces which are maintained at cooling temperatures by water circulation. It is not here, but rather in the design of the baffle employed to secure a maximum of contact and a minimum of stagnant oil, that the apparatus shown possesses decided novelty.

This baffle is, in a word, a helical sheet of metal which passes around and around inside the cooling cylinder. The cooling tubes pierce this baffle again and again by means of holes which are cut with greatest care to give a tight fit. It will be seen that under this arrangement, no particle of oil can take a short cut to its destination; the only possible road through the cooler is that which takes the oil along the full course of the baffle. Moreover, circulation of the oil is constant and uniform; the spiral roadway through which it is driven has no dead corners where dirt can collect or eddies form. Finally, quite apart from the regularity of operation emphasized just now, the helical baffle secures an incredibly long oil path for a given amount of cooling surface—yet a path at all points along which the oil is in intimate contact with the cooling surfaces.



The new oil cooler, broken away to show the helical baffle

Among the incidental advantages which the ingenuity of the maker has given this cooler is a removable tube bundle. The entire collection of cooling tubes, with the baffle sheet, may be removed from the shell for inspection and cleaning, without breaking any oil connections. Further than this we do not go; there would be little point in removing the baffle itself from the tube bundle, and if we did there would be trouble putting it back with tight fits. Besides, if we once got the baffle sheet out by itself, we should probably be so struck dumb by its extraordinary shape, standing alone, that we should never dare try to put it back. Surely, if a person who did not know what it was should meet this highly perforated snake of sheet metal, he might be excused for not knowing what it could possibly be used for.

In addition to its use with lubricating and quenching oils, the makers of the helical baffle point out that it is of value for recovering heat from waste liquors in dye houses and other chemical plants. The efficiency of the cooler is in no way affected by the position of installation. As to just what that efficiency is, the manufacturer points to tests showing that the rate of heat transfer is greatly in excess of that which has been secured by previous types of commercial oil coolers, while at the same time the drop in oil pressure is lower than customary.

War Activities and the Patent Office

NATURALLY one would think the Patent Office would play a large part in recording evidences of war activities along the inventive line; but few would think how great a part it does play.

There are 45 examining divisions in the Patent Office. Recently a canvass of the office was made to determine the various forms of inventions for use in the war and it was found that 41 out of the 45 divisions of the Patent Office were handling or had handled cases of interest in connection with the war. So that out of 45 divisions, only four were found whose work did not involve in some way or other a consideration of inventions of interest in connection with the war.

Extensions in Patent and Trade Mark Cases

By E. B. Marshall

ALMOST peculiar situation has arisen in connection with the filing and prosecution of United States patent and trade mark applications by foreigners, and the filing and prosecution of similar applications abroad by citizens of the United States.

Many countries have enacted laws granting extensions of time to file and prosecute patent and trade mark applications where the applicant has been prevented, by circumstances connected with the war, from taking the necessary action within the periods prescribed by the general laws. These war provisions are reciprocal; an applicant, a citizen of one country, is not entitled to an extension under the war provisions of another country, unless, under the practice in the applicant's country, similar extensions are granted to foreigners.

In 1916, the United States enacted such a law providing for the grant of extensions where the applicant is "unable on account of the existing and continuing state of war" to take the necessary action within the period limited by the general laws. While the second section of said law distinctly stated that "no extension shall be granted under this Act to citizens or subjects of any country while said country is at war with the United States," the Trading With the Enemy Act, which

(*Concluded on page 597*)

Fleet Performance

The Maker

Federal Motor Truck Co., Detroit.

The User

Denver Gas & Electric Light Co., Denver.

The Bearings

Timken Bearings on front and rear wheels, at the differential and on the worm shaft.

The Record

Since the middle of 1917, a fleet of Federal trucks has been in operation constantly in the service of this public utility company. Each truck is averaging forty to fifty miles per day, and although they have been operating more than a year there has been no need of either bearing repair or adjustment. Just another instance to prove that Timken Bearings wear as little as any bearing even before take-up makes the bearing new again.

Do you *know* just what it costs to operate your trucks? If not we can refer you to a simple, practical and economical way of keeping an accurate and complete record of truck maintenance.

THE TIMKEN ROLLER BEARING COMPANY
Canton, Ohio

TIMKEN BEARINGS

FOR MOTOR CAR, TRUCK & TRACTOR

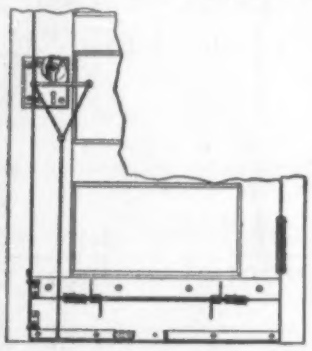
RECENTLY PATENTED INVENTIONS

Pertaining to Apparel

WOMAN'S WORK AND SPORT GARMENT.—H. L. Ochsner, care of Alpena Art and Novelty Co., Alpina, Mich. The invention relates particularly to women's overgarments, residing in the skirt portion of a dress to be worn with bloomers, the object being the provision of a skirt arrangement of such a nature that its sections may be folded readily and quickly when desired to expose the bloomers, when engaged in housework, gardening, sport and the like.

Of General Interest

WEATHER STRIP.—E. A. Brady, 10th and Water Sts., Oregon City, Ore. The object of the invention is to provide a device for use with outer doors, wherein the weather strip is mounted at the lower edge of the door and is so arranged that when the knob is turned to open the door the weather strip will be lifted out of contact



A PARTIAL FRONT VIEW OF DOOR PROVIDED WITH DEVICE

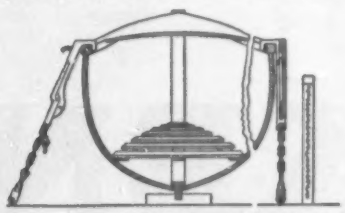
with the floor or door sill, mechanism is provided for holding the weather strip in raised position until the door is closed, when said mechanism will be released to permit the weather strip to be lowered into place to close the opening beneath the door.

DEVICE FOR USE IN ASSORTING CHECKS AND OTHER PAPERS.—E. T. Linsley, Alexandria, S. D. This device is of the type in which guide cards or index cards are employed, between which the papers are temporarily

PERSPECTIVE VIEW OF THE DEVICE

placed in the assorting process, and more particularly the invention relates to an assorting device in which different classes of papers such as bank checks and deposit slips may be disposed at the respective ends and maintained separate while being sorted and until they are to be removed.

LIFEBOAT GRIP.—F. G. Erricson, care of Tietjen & Lang Dry Dock Co., Hoboken, N. J. S. S. Wm. P. Palmer. The invention has particular reference to grips or devices employed for Tietjen & Lang Dry Dock Co., Hoboken, N. J. S. S. Wm. P. Palmer. The invention has particular reference to grips or devices employed for lashing lifeboats on ship's decks, but preventing



SHOWING A VERTICAL TRANSVERSE SECTION AND MODIFICATION OF DESIGN

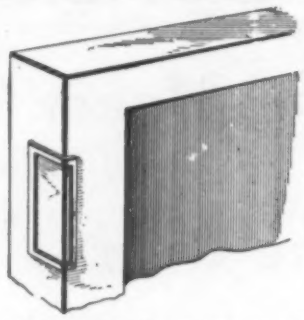
them from swaying, tilting or swinging with respect to their davits, the device can be easily and quickly released in the event of emergency but is so constructed that its release shall not be interfered with by snow, ice or any other weather conditions, the grip can be released from the boats by any passenger or occupant of the same.

THEATRICAL APPARATUS.—E. B. Hurford, 507 W. 111th St., New York, N. Y. Among the principal objects which the invention has in view are, to provide a water screen and means for rendering the same non-transparent, to provide container having normally transparent walls with means for changing the wall, so as to form a screen for the interior of the container, means for introducing a person or object into the container without detection, and means for withdrawing a filling liquid from the container without its being observed.

VEGETABLE GLUE OR ADHESIVE.—R. W. Tunnell, 15 N. 5th St., Philadelphia, Pa. The object of the invention is to provide an adhesive suitable for wood work, bill posting, size making, etc. The composition belongs to that class of adhesives of vegetable origin produced from starch which has been modified of hydrolyzed by the action of acids or alkalis, and zinc chlorid. The resultant product is a degenerated starch glue with increased adhesiveness. The object being to increase the binding power and making the glues more waterproof.

Hardware and Tools

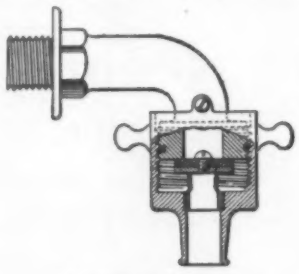
GAGE.—G. Holt, Galeton, Colo. The object of the invention is to provide a device adapted for use in hanging doors, for indicating the amount and extent of the wood to be removed for the reception of the hinge. The device comprises a



A PERSPECTIVE VIEW OF THE DEVICE

rectangular frame consisting of side members and connecting end members integral therewith, one of the side members and portions of the end members being bent laterally to extend at right angles with respect to the plane of the frame, the other side member having a laterally extending rib forming a marking edge.

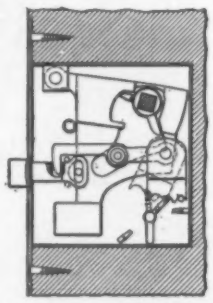
LIQUID FAUCET.—C. W. Wagner, 245 E. 123d St., New York, N. Y. Among the principal objects which the invention has in view are to provide a faucet which may be readily repaired or the wearing members of which may be easily replaced, and to minimize the space occupied;



A VERTICAL SECTION

The faucet comprises an externally threaded head having a delivery channel provided with a valve seat, a nozzle having a valve head cooperating the seat, an internally threaded chambered body portion screwing on the head, a packing ring mounted in the threaded portion of the head, the ring being adapted for compression, for sealing the joint between the body and head.

LOCK.—W. N. Butler, Prairie Grove, Ark. The invention relates to mortise and rim knob locks, and more particularly to a gravity lock in which the bolt is thrown through the medium of devices actuated by the knob spindle and in which separate key controlled devices serve to



SECTIONAL SIDE VIEW, SHOWING BOLT PROJECTED

lock or release the bolt for permitting its operation by the knob spindle, the arrangement doing away entirely with springs for controlling the parts thereby providing a strong construction involving simple parts and avoiding the annoyance of broken or damaged springs.

TAP.—C. E. Lloyd, 718 S. Palafox St., Pensacola, Fla. The invention relates generally to metal working tools and implements, and particularly to threading taps which as well known require the provision of bores of certain size for the different size of taps, the prime object is to provide a tap having indications in connection therewith denoting the particular size of the bore corresponding to the particular tap.

BRAKE SOCKET FOR OPEN MOUTHED BILGE PUMPS.—C. E. Lloyd, 718 S. Palafox, St., Pensacola, Fla. The invention relates particularly to bilge pumps and more especially to the brake sockets thereof, which engage the plungers and normally receive a hand lever in the socket in order to in turn reciprocate the plungers, the object is to provide a brake socket having means whereby a vertically movable power connection may be applied thereto for the power actuation of the plunger instead of the hand lever, which latter is movable generally in a horizontal plane.

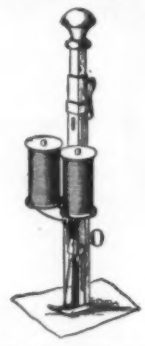
UNIVERSAL MICROMETER.—P. Lackner, care of Neisel Press Mfg. Co., 944 Dorchester Ave., Boston, Mass. The invention relates to measuring instruments and particularly to a micrometer, it has for an object the provision of a construction whereby the usual calipers effect is produced and at the same time a micrometer adjustment provided. Another object is to provide a micrometer instrument having caliper legs associated with mechanism for causing the opening and closing members to maintain the same distance from the center at all times.

Household Utilities

WASHBOARD.—J. Brommer, 401 Waverly Ave., Brooklyn, N. Y. An object of the invention is to provide a construction wherein the top, bottom and sides may be removed for cleaning or for packing, and may be reassembled quickly and easily. A further object is to provide a washboard the sides of which may be removed and the body collapsed by reason of a hinge so that the board may be easily stored.

Machines and Mechanical Devices

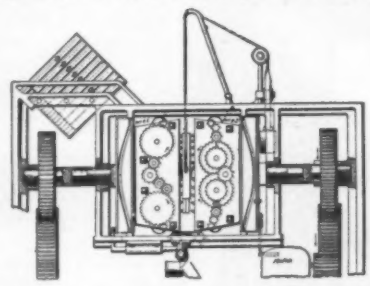
EMBROIDERY MACHINE.—W. Cohen, 68 W. 17th St., Bayonne, N. J. The invention has for its object the provision of a hand operated embroidery machine wherein any desired depth or length of loop may be provided by an adjustment of parts. Further objects are to provide a machine with one or a plurality of needles, and



A PERSPECTIVE VIEW OF THE MACHINE

sources of supply for the needles so that a plurality of rows of embroidery loops may be produced at one time, the machine is provided with means for automatically feeding itself forward regardless of the adjustment of the needles as to the length of loop provided.

BORING MACHINE.—E. T. Miller, 113 Reynolds St., San Antonio, Texas. The invention relates particularly to a machine for boring brush blanks, the primary object being to provide a machine which will bore all the necessary openings both straight and at an angle, at a single operation, and to provide a pair of relatively



PARTIAL SIDE ELEVATION WITH PORTIONS BROKEN AWAY

movable boring heads, each having a battery of bits, together with means whereby to so move the short bits as to cause quick clean movement of the same into the blanks. Another object is to provide a movable boring head, with means for automatically feeding blanks there between.

Medical Devices

GLASS SYRINGE.—I. R. Shull, care of Becton Dickinson & Co., Rutherford, N. J. The invention relates to syringes in which the barrel and plunger are both made of glass. In syringes of this type it is difficult to see the amount of liquid drawn into the barrel, the invention provides a syringe to enable the user to see and correctly determine the amount of the fluid drawn into the barrel. In order to accomplish this result the glass plunger being hollow is provided with an interior reflecting lining to form a strong contrast between the plunger and the barrel for gaging the amount of liquid.

DENTAL INVESTMENT COMPOUND.—J. D. L. Tench, Graham Bldg., Gainesville, Fla. The object of the invention is to provide a compound in the form of a dry impalpable powder, which may be made into plastic condition by adding water to provide an investment for surrounding a wax model, which is afterward burned out by the use of heat, leaving a matrix for the metallic casting. The compound comprises carborundum powder and plaster of Paris in the ratio of two and one-half parts of the first, and one part of the second.

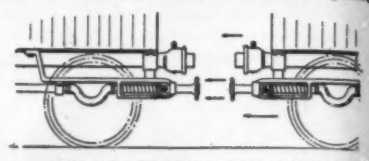
Prime Movers and Their Accessories

CARBURETER.—D. M. De Witt, Russellville, Ark. The object of the invention is to provide a carbureter having a vacuum chamber which is also the full chamber connected with a nozzle in a mixing chamber, there being a valve connection between the vacuum chamber and the outlet from the mixing chamber, the valve of which, is connected with a float in the vacuum chamber so that when the level of hydrocarbon in the vacuum chamber goes below normal, the valve will be opened by the downward movement of the float, and the suction at the outlet will reestablish the vacuum in the vacuum chamber to maintain the level of the hydrocarbon.

BOILER.—M. E. Hembert, care of Herbert Boiler Co., Root and La Salle Sts., Chicago, Ill. The invention relates to boilers of either the down draft or direct draft type, the object is to provide improvements in the construction of such boilers, as will enable the presentation of a greater heating surface and the production of a maximum combustion space in order to render the same highly economical in the use of fuel and highly effective in the consumption of smoke.

Railways and Their Accessories

AIRBRAKE CONNECTION.—S. A. Rousseau, De Witt, Ark. The invention has for its object to provide mechanism of the character specified, adapted for coupling the train pipe sections of an airbrake system without requiring



SIDE VIEW SHOWING UNCOUPLED POSITION

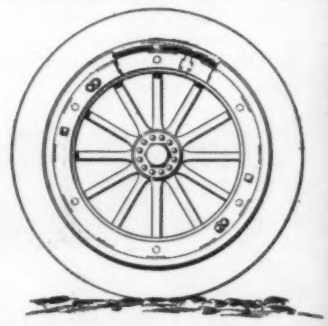
the brakeman to go between the cars, the coupling being automatically brought about by the coupling of the cars and wherein the act of coupling connects the sections of the train pipe.

Pertaining to Recreation

WHEELED RECIPROCATING TOY.—A. Z. Baker, 393 Mulberry St., Newark, N. J. This invention relates to a wheeled toy having identical stationary and reciprocating members with means thereon for simulating motion from either side of the stationary or the movable member when the reciprocating member is actuated by the motion of the wheels.

Pertaining to Vehicles

AUTOMOBILE WHEEL RIM.—E. H. Davis, address, P. A. Monteverde, 136 Vance Ave., Memphis, Tenn. Among the objects of the invention is to provide a rim consisting of a fixed fully carried section and a removable section and interlocking means carried by the fully and by the removable section, through the operation of

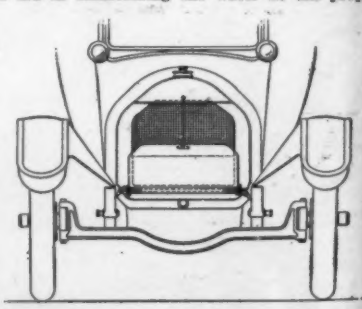


VIEW IN ELEVATION, PART OF RIM BEING BROKEN AWAY TO SHOW CONSTRUCTION

which the removable section may quickly and easily be mounted in place for coaction with the fixed section in retaining the tire on the wheel, means of novel nature being provided for securing the removable section against accidental displacement. The device is especially for motor wheels using pneumatic tires.

CROSS CHAIN FOR TIRES.—F. R. Turner, 100 Savin Hill Ave., Uphams Corner P. O., Boston, Mass. The invention relates to anti-skid chains for tires. the general purpose is to provide elements associated with the links of a cross chain so formed and disposed relatively thereto as to present an increased surface, thereby distributing the wear, and prolonging the life of the links, and at the same time very materially contributing to the strength of the cross chain. To attain the object use is made of blocks within the links of the cross chain, the device is arranged for use with either ordinary pneumatic tires or the solid tires used on heavy vehicles.

COVER FOR RADIATORS.—F. M. Cockrell and J. M. Rockwell, 203 Brown St., Liberty, Miss. This invention relates to a protective cover for radiators of automobiles, whereby to conserve the heat thereof in cold weather and to aid in maintaining the water at the proper



FRONT ELEVATION OF AN AUTOMOBILE COVER, WITH INVENTION APPLIED

temperature. More particularly the invention relates to a curtain arranged to wind upon or be unwound from a spring roller, the curtain being adapted to close to any desired extent a front opening formed in the cover.

Designs

DESIGN FOR A WATCH CHARM OR SIMILAR ARTICLE.—H. C. Kerfen, 584 Broadway, Brooklyn, N. Y. The inventor has secured patent on an ornamental design for a watch charm, the upper portion of which is in diamond form with decutated appendage.

NOTE.—Copies of any of these patents will be furnished by the Scientific American for ten cents each. Please state the name of the patentee, title of the invention, and date of this paper.

Making War Specialists of Young America

AMERICAN initiative and ambition are asserting themselves in the present draft—the means whereby the United States is rapidly raising one of the mightiest armies ever assembled under one banner. Indeed, young men within the draft ages are giving serious attention to things military long before they are called into the service; and in many instances they volunteer in some chosen branch, and in again as many instances they take up certain studies destined to aid them in military life.

Among the subjects studied by young Americans these days is radio telegraphy, for it is well recognized that there is great need for wireless operators both in the Navy and in the Army. Radio schools, to be sure, are not a wartime novelty; long before the war there were numerous institutions of that kind throughout the country, furnishing young men and women to telegraph and wireless concerns. But since the United States entered the war the number of radio schools has been greatly augmented, and in practically every case they are being attended to capacity.

The East Side Y. M. C. A. of New York city is typical of the radio schools in operation throughout the United States just now. Many young men in the draft, with a view to rapid promotion in the ranks when their turn comes to be inducted in the service, are mastering the wireless code and the manipulation of apparatus at that school. The former is acquired by constant practice many hours a week, in which the students first master the dot-and-dash language and then train their ears to the mysterious buzzes.

The radio class rooms at this institution are quite suggestive of a library reading room. The students sit about a long table, wearing telephone receivers after the fashion of telephone operators. The instructor or one of the students manipulates a telegraph key in order to send press messages, commercial messages, and messages in code. Obviously, the sending speed is quite slow at first, and press messages are sent for the most part because the student can more readily follow the succession of letters and words since there is a definite train of thought involved and he can fill in where necessary. But as he progresses in his studies the sending speed is increased; commercial messages with many figures and names are buzzed out for him to decipher; and, finally, when quite proficient, he is tried out on code messages, in which event there is no opportunity for guessing or filling in.

All telephone receivers on one table are connected in a common circuit, so that all students at that table receive the same messages. If desired, however, two or three tables can be connected together. By an ingenious arrangement the buzzer which produces the high pitched dots and dashes in the telephone receivers, is permitted to operate continuously, but the transmitting key serves the break the interrupted current passing to the receivers. In this manner it is not necessary to start and stop the buzzer each time a dot or dash is made, and the result is a more smooth and better sounding signal.

Depending upon the student's ability to learn, the course may take anywhere from two or three months to six months, until he can pass the Government examinations and receive a license as radio operator. The course also includes certain instruction regarding wireless apparatus, and for this purpose the school has a worthy collection of commercial instruments. However, due to the present Government regulations prohibiting the operation of wireless stations other than those under Government control, the apparatus is not in actual working order. This, of course, is a big handicap. Previous to our entrance into the war the East Side Y. M. C. A. maintained a wireless station which, on certain occasions, communicated with amateur wireless stations as far west as Chicago, and on one occasion communication was opened up with an amateur in Los Angeles.

Wireless telegraphy is also being studied by certain young women, at this school as well as at other institutions, with the object of their serving as instructors should there be occasion for their services in the future.

Another important military study is the machine gun. At the same institution many New York boys are taking a special machine gun course. For instruction purposes elaborate colored charts are used, showing every part of the Lewis gun, while real practice is obtained by working on an actual weapon, under the guidance of a Lewis gun expert. Before the student graduates from this course he must know the weapon not only by sight but by touch; which is another way of saying that when blindfolded, he must take apart and assemble the gun without a hitch.

Other Y. M. C. A. branches are offering other military courses. For instance, the West Side Y. M. C. A. has an excellent course for airplane mechanics. There, young men are taught the practical side of airplane engines and airplanes, and taught how to groom the winged steeds of our fighting airmen.

All in all, the young men of the country are anxious to do something worth while and be someone in the Army and Navy. So they are turning, in ever-increasing numbers, from commercial pursuits and from peaceful studies to the subject of war. And just for that, the task of the military authorities is that much lighter when these young men enter the service.

The War Activities of Our Technical Societies

(Concluded from page 586)

more work of a highly confidential nature.

The Society for the Promotion of Engineering Education has prepared in detail the modification of engineering curricula to meet war conditions, and has worked out a just modification of the draft law, so that engineering students who have been drafted may be assigned to finish their collegiate work in courses which will specifically and expeditiously prepare them for immediate Government service. Special information has been furnished the departments of the Government, including lists of all books on the application of engineering to the war. The National Society for the Promotion of Industrial Education has trained several hundred electricians for the Navy, in connection with the electrical school of the New York Navy Yard. Similar work is under way for the Signal Corps.

The National Association of Master Steam and Hot Water Fitters has furnished engineers and draftsmen to lay out the steam equipment for power and heating in connection with hospitals, officers' quarters, barracks and other buildings at the cantonments, as well as many other structures already under construction and to be built for various branches of the service.

The American Electric Railways Association has a committee with representatives in the several military departments of the Government, which, in coöperation with the Council of National Defense, is preparing a comprehensive map of all the electric railways, showing their availability for war transport.

The American Museum of Safety has been coöperating with the Government to conserve lives and workers in Federal industries. It undertook a safety survey of Federal plants, the Director of the Museum being placed in charge of safety inspection work. As the result of this survey, the Government placed an experienced safety engineer in each navy yard and arsenal, and a Central Safety Committee has been organized in Washington for directing the Government's accident prevention work. The Director of the Museum has been appointed Chief Safety Expert of the United States Employees' Compensation Commission, and the trustees have released him to serve without cost to the Government as Advisory Safety Engineer.

The American Chemical Society, in addition to participating in the Research Council and the Naval Consulting Board, has coöperated with the American Institute of Mining Engineers and the Bureau of

Mines in the preparation of a census of chemists, metallurgists and mining engineers, for which there was great need. The society was prominent in a movement to protect the needs of the Government in the matter of platinum supplies for scientific and industrial work. It has coöperated in the selective draft, just as has the Society for the Promotion of Engineering Education, and has arranged that drafted chemists shall be assigned to their special work, for which the Government has great demand.

The Engineering Council representing the four associations of civil, mining, mechanical and electrical engineers, has already collected classification data of several thousand professional engineers, is continually extending its lists, and eventually plans to have catalogued 110,000 professional engineers and technical men. This committee for months has been supplying all departments of the Government and the industries generally with the names and abilities of specialists in all lines—a service entirely without charge.

The American Engineering Standards Committee, representative of several of the societies already mentioned, is assisting in an international as well as a national service of standardization of all kinds, both for the period of the war and afterward.

And so it goes. The above does not pretend to be a complete catalog of what our scientific and engineering bodies have done for the war.

Extensions in Patent and Trade Mark Cases

(*Concluded from page 592*)

became a law in 1917, not only provided for the filing of patent and trade mark applications by an enemy but also provided for the grant of extensions to enemies in patent and trade mark cases on a reciprocal basis. These provisions with reference to the enemy are still in force, but the 1916 law providing for the grant of extensions to our Allies and neutrals was only operative to relieve from defaults occurring from August 1st, 1914, to January 1st, 1918.

A bill is now before Congress for the amendment of the 1916 law, so that our Allies and neutrals will be entitled to extensions when circumstances connected with the war have prevented the filing and prosecution of patent and trade mark cases. The bill states that such extensions may be obtained during the war and for a period of six months thereafter and that extensions of nine months may be granted.

The bill has been recommended by the Commissioner of Patents, and as its passage is necessary in order that our Allies and neutrals may receive the same benefits that we are now granting to the enemy, it is to be hoped that Congress will feel disposed to enact the new law without debate or delay.

What One Munition Firm Is Planning to Do After the War

EVERY so often we pause in the midst of our tremendous military activities and ask each other the question: What shall we do with these big munition plants and organizations when we no longer need such vast quantities of guns, shells, airplanes, armored cars, and so on? Generally, we do not dare to think of peace until the military situation is far more promising than it is now. And so we do not make definite plans regarding what is to be done with the numerous establishments now devoted to making the implements of war.

But the firm of Vickers, Ltd., one of the largest concerns in Great Britain, has given some thought to the after-war problem, and has even arrived at fairly comprehensive plans. This firm has its headquarters in Sheffield, but its various business enterprises are not confined to the British Isles, since it includes plants in various parts of the world, and some of these latter, which come under the head of "Armament," are affiliated with the governments in the countries in which they are located.

At a recent meeting of the shareholders of Vickers, Ltd., Mr. Douglas Vickers, who presided, took advantage of the occasion to outline the after-the-war schemes the directors had in view as regards the commercial enterprises of this important firm. Doubtless many of these enterprises will prove of interest to business firms in our own country, and contain suggestions as to how plant that have been engaged on war work can be utilized for other purposes.

The directors have given a great deal of thought to the utilization for peace purposes of as much as possible of their war plant. Much of this class of plant (including rifling machines and many of their shell machines), of course, are not usable in times of peace, and such would be stored in readiness for any future contingencies that might rise.

At one factory employed in the manufacture of automatic guns the firm has a large number of what might be called general service machines, and it is proposed to devote 1,700 of these to the manufacture of sewing machines. At another plant the firm is already manufacturing sewing machines for sale, in order to test the market, and it has succeeded in producing a sewing machine which has given satisfaction, and which the officials expect in the course of time to place on the market in large quantities.

At another of the Vickers works in the south of England, it is proposed to manufacture on a large scale certain semi-electrical devices for motor cars and a speed controlling apparatus. At another plant where good wharfage is available, it is intended to establish a plant for the manufacture of various wooden articles, and for this purpose there will no doubt be employment for a large number of machines now doing war work. In fact, woodenware is already being turned out at this plant, using waste pieces of wood that have accumulated in connection with war work.

At the Barrow works the firm is arranging to build a much larger proportion of mercantile ships and is also making plans for developing the manufacture of heavy-oil engines as well as land boilers and large gas engines.

The Vickers organization intends to continue its works in Sheffield on much the present scale and to develop some of the older trades that have suffered in recent years on account of development in the direction of war material. Its electrical business in Sheffield will be continued, and it proposes to specialize here in this class of work. In addition to the electrical work to be carried on in Sheffield, the firm has associated itself with the Metropolitan Carriage, Wagon, and Finance Company in the control of the British Westinghouse Company. This arrangement has altered its plans for the erection of a large plant which has been contemplated in connection with the enlargement of the electrical schemes. The organization has also acquired the Bosche Magneto Works, which it proposes to carry on in Birmingham on a large scale. In Birmingham also it is developing the manufacture of a new material which has been placed on the market under the trade name "Duralumin." This material has about the same weight as aluminum and approaches mild steel in strength.

Making a Road for the Fire Engine

THE City of Covington, Ky., has installed a unique fire signaling system for traffic to stop when the fire apparatus is on the way to a fire. A bell and flashlight have been installed in the middle of the chief street of the city and whenever a fire is sounded the bell rings and the light flashes. This means that all traffic in all directions must stop. The bell may be heard for squares and the light is very powerful. The apparatus has proven to be very effective; and while it could, in a large city, be applied only by means of some zone arrangement, it is obviously a sound idea to make *all* traffic in the entire neighborhood stop until it is established just where the engines are going. A good many accidents and a good many delays in getting the engines to the fire should be prevented by general adoption of the Covington plan.

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Note.—Illustrated articles are marked with an asterisk (*). Look for the general subject rather than the supposed specific titles of articles. Thus: "Aeronautics," "Automobiles," "Meteorology," "Panama Canal," etc., will give related articles much more quickly than by reference to the title.

(Concluded on page 600)

Making Soldiers of College Boys

IN order to provide military instruction for the college students of the country during the present emergency, a comprehensive plan will be put in effect by the War Department, beginning with the next college year, in September, 1918. The details remain to be worked out, but in general the plan will be as follows:

Military instruction under officers and non-commissioned officers of the Army will be provided in every institution of college grade, which enrolls for the instruction 100 or more able-bodied students over the age of 18. The necessary military equipment will, so far as possible, be provided by the Government. There will be created a military training unit in each institution. Enlistment will be purely voluntary, but all students over the age of 18 will be encouraged to enlist. The enlistment will constitute the student a member of the Army of the United States, liable to active duty at the call of the President. It will, however, be the policy of the Government not to call the members of the training units to active duty until they have reached the age of 21, unless urgent military necessity compels an earlier call. Students under 18, and therefore not legally eligible for enlistment, will be encouraged to enroll in the training units. Provision will be made for coordinating the Reserve Officers' Training Corps system, which exists in about one-third of the collegiate institutions, with this broader plan.

This new policy aims to accomplish a two-fold object: First to develop as a great military asset the large body of young men in the colleges; second to prevent unnecessary and wasteful depletion of the colleges through indiscriminate volunteering, by offering to the students a definite and immediate military status.

Later announcement will be made of the details of the new system. In the meantime presidents of collegiate institutions are requested to call this matter to the attention of all their students. Those who do not graduate this spring should be urged to continue their education and take advantage of this new opportunity to serve the nation.

Saving Grain in Threshing

THE United States Food Administration estimates that approximately three bushels of grain are lost in every 100 bushels threshed, because of careless methods in handling the grain, and that this amount can be saved if the farmers of the country will follow certain simple suggestions which have been put forth. If this is done, and figuring on a crop of 800,000,000 bushels of wheat this year, which government reports indicate is more than probable, 24,000,000 bushels of wheat, worth, at $2.20 a bushel, the huge sum of $54,000,000 will be saved to the country. The saving on oats and other small grains will be in proportion.

In order to impress upon farmers the necessity of employing more careful methods in threshing, the food administration has created a grain threshing division, which is under the direction of Captain Kenneth D. Hequembourg, an active wheat producer of Oklahoma, and has entered upon a campaign which it is hoped will bring about the desired results. It is proposed to carry on educational work among farmers through the medium of committees which are to be established in each county. These committees will be composed of the county food administrator, county agricultural agent and a retired thresherman representing the local council of defense.

Agriculturists, threshing machine men, and others with an intimate knowledge of the subject, while readily admitting that there is a big waste in threshing operations, ask how much of this waste can be saved, and in what manner it can be accomplished. In answer to this the food administration grain corporation gives the following details:

One and a half bushels in each hundred can be saved by having all machines go into harvest in excellent repair, with ample power, and by seeing that during harvest they are sufficiently adjusted to meet varying conditions, so that a minimum of grain is blown into the straw piles. One bushel per hundred is conserved by having all machines in such repair that very little grain leaks under and around them on to the ground, and if what does leak out in this manner and is otherwise scattered about the machine, is cleaned and threshed before the machine leaves the field. Finally, ¾ bushel is to be rescued from waste by careful handling of bundles from the shock to the machine or stack, and by arranging the bundle wagons so that all grain which shatters therein shall be caught and saved. In connection with the latter it is suggested that the bottoms of wagons be made tight, or that canvas sides be provided if necessary.

The percentage of wheat which has been lost in the past by being distributed upon the ground or into straw piles to be fed later to animals on the farm is a very considerable one, but farmers as a rule have overlooked leakages with the excuse that the stock would get the benefit when they were turned in. During the present year, however, when no wheat at all should be fed to animals, the food administration is anxious to discourage this practice.

Many reports have already come in of straw piles appearing green with sprouted grain. In some sections of Kansas threshing outfits made it a profitable practice last year to follow other threshing outfits, purchase the straw and re-thresh. Instances of from 3 to 7 per cent saving by this rethreshing have been common.

The importance of having all machinery in perfect shape for threshing can not be overestimated. This includes keeping the thresher cylinder up to speed; keeping all teeth sharp and straight; seeing that pulleys and belts are capable of delivering sufficient power, with a safe margin of excess, to keep the separator up to the required speed; making proper adjustment of concaves and other parts of the separator, and arranging that extra supplies and repair parts are on hand.

Motor Boats Sink Battleships

(*Concluded from page 581*)

launching of the 14-inch Whitehead torpedo. As each torpedo carries 200 pounds of high explosive in the war head, they must be of that short-range and moderate-speed type which, in the larger sizes, the Germans are using for close-up attack against merchant ships. The detonation of two, 200-pound charges in the region of the boiler rooms, makes it pretty certain that Rizzo sent his ship to the bottom, and the blow of one such torpedo against the other Austrian battleship must certainly have so far disabled her as to render her return to port a very doubtful matter.

The Austrians possessed four battleships of the "Viribus Unitis" class, the other three being the "Tegetthof," "Prinz Eugen" and "Szent Istvan." The "Viribus Unitis" was torpedoed, recently, during a daring raid of the Italians in Pola harbor, and that disaster, coupled with the recent losses, leaves Austria presumably with only one capital ship of the first class. These ships are of 20,000-tons displacement and 20 knots speed. They are armed with twelve, 12-inch guns carried in four, 3-gun turrets. They mount, also, a torpedo broadside of twelve, 5.9-inch guns and eighteen 11-pounders. The belt and turret armor is 11-inch, and there are two conning towers—the forward one being protected with 11¾ inches and the after tower with 9¾ inches of armor. There is also a range finding position carrying 6½ inches of armor. These terrible losses will go far to offset the capture by the Germans of three dreadnoughts of the same general type that were completed or partially built by the Russians in the Black Sea.

A Patriotic Burglar

A GROCERY store at Council Bluffs, Iowa, was robbed, one Sunday night, of five sacks of wheat. Apparently during the ensuing 24 hours the attention of the thief was drawn to the regulation of the Food Administration that for every pound of wheat flour a pound of some other cereal must be obtained; for on Monday night he did his patriotic duty by returning and making off with five sacks of corn meal.

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Simple as A B C

THERE is nothing mysterious about the supremacy of Winther Internal Gear Drive Motor Trucks.

It is true that in less than two short years Winther Trucks have taken their rightful place among the foremost trucks built anywhere in the world today.

It is true that Winther Trucks have established new standards of economy in upkeep and maintenance and of efficiency in motor truck transport.

It is true that among those who deal in motor trucks the Winther connection is considered as most desirable — Winther Trucks are "easy" to sell.

These are facts known to almost every one. Yet there is nothing strange about them, unusual as they seem to be—and are. The reason for this marvelous record of Winther in both sales and service is as simple as A-B-C.

You have only to look to the facts of how Winther Motor Trucks came into being, to understand.

Winther Motor Trucks are the direct result of the late military expedition into Mexico under General Pershing. They applied for the first time to *commercial* use, the lessons there learned concerning motor trucks in *military* use. It is an admitted fact that the Mexican service was the most severe to which motor trucks have ever been subjected. It is an admitted fact that the lessons there learned changed, almost over night, the whole trend of motor truck design.

Winther, in a new factory, with neither old policies nor old equipment investments to be protected, alone *was able to fully apply these lessons.*

It is not strange that this truck, the direct outgrowth of war time conditions, has best met war time conditions in commercial use.

It is not strange that Winther Trucks should be trucks of greater economy, more free from trouble, and of immeasurably wider usefulness.

Winther has made possible the long haul of today *with economy.*

Winther has solved and is solving train tie-ups, embargoes, priority shipment rules, etc., etc., etc., for scores of American manufacturers.

Winther Trucks are delivering today from Coast to Coast, trucking service in every branch of American industry, unthought of and undreamed of two years ago.

The point of it all is simply this: with transportation problems which will become increasingly difficult as the months pass, wouldn't it be wise for you to find out *now* what Winther equipment can do for you?

There is a Winther of the correct size and capacity to meet every trucking need. One way to cut hauling costs is to use trucks to meet your needs, not force the need to fit the truck.

WORMLESS

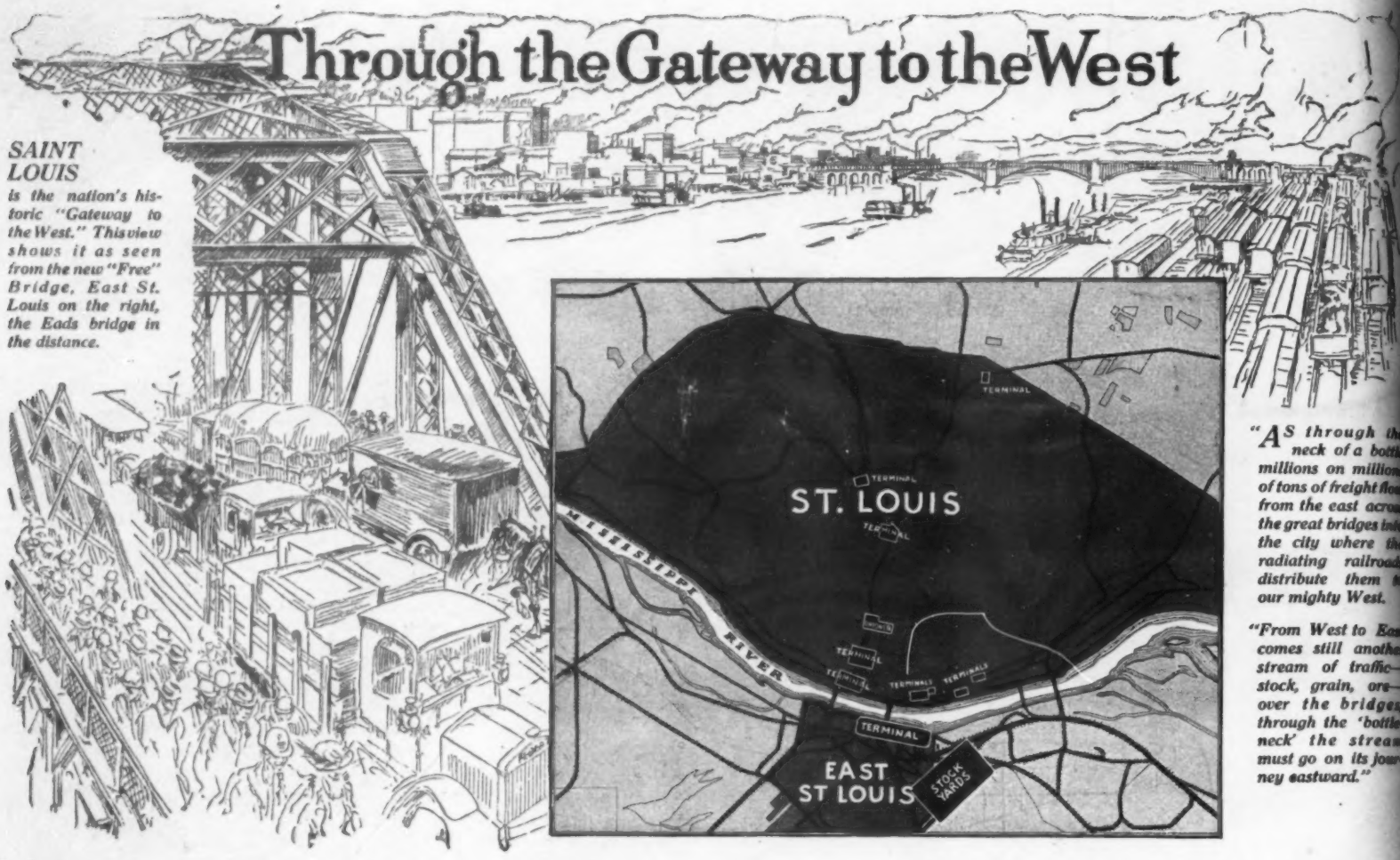
WINTHER MOTOR TRUCKS
WINTHROP HARBOR, ILL.

Model 38 Maximum Capacity 1½ tons
Model 48 Maximum Capacity 2 tons
Model 68 Maximum Capacity 3 tons
Model 88 Maximum Capacity 4 tons
Model 108 Maximum Capacity 5 tons
Model 128 Maximum Capacity 6 tons
Model 148 Maximum Capacity 7 tons

WINTHER MOTOR TRUCK COMPANY

Department H **Winthrop Harbor** **Illinois**

Through the Gateway to the West



SAINT LOUIS *is the nation's historic "Gateway to the West." This view shows it as seen from the new "Free" Bridge, East St. Louis on the right, the Eads bridge in the distance.*

"AS through the neck of a bottle millions on millions of tons of freight flow from the east across the great bridges into the city where the radiating railroads distribute them to our mighty West.

"From West to East comes still another stream of traffic—stock, grain, ore—over the bridges, through the 'bottle-neck' the stream must go on its journey eastward."

How Federals Help Solve the Terminal Problem

Even before the war, St. Louis was quick to adopt the motor truck as a vital aid to her wonderfully developed terminal system.

The towering bodies of powerful Federals soon found their place amid the roaring babel of the mammoth terminal freight sheds.

But with the war, however, motor trucks showed their full possibilities. Traffic congestion became greater than ever before.

Necessary regulation abolished the convenient "trap" car that collected and distributed freight locally on both sides of the Mississippi.

The terminal problem was therefore tangled anew, but Federals proved themselves equal to the emergency.

Unfettered by rails, they are more than supplanting the banned trap car. Wherever business requires and a road leads they are going.

In the great commission districts, over the bridges, at the packing houses—for wholesaler, manufacturer, shipper, they are doing their part toward keeping the flow of traffic unimpeded through the bottle-neck.

Every city has its terminal problem. In every city, Federals are helping to meet the situation.

Unfailing dependability, so essential in work of this sort, makes the Federal name familiar at all the great terminals of the country.

Federal Motor Trucks, Capacities One to Five Tons

Federal Motor Truck Company Detroit, Michigan